RAILROAD GAZETTE

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Contributions.

Metric Tables for Transitmen.

Kansas City, Mo., Dec. 14, 1898.

To the Editor of the Railroad Gazette:

During the past 15 years I have had the direction of a number of railroad surveys in the Republic of Mexico, where the metric system of measurement was required throughout.

The field books used by assistant engineers and instrument men were not properly arranged for that system, and in the aggregate a considerable time was lost and some errors crept in through reducing radii, tangents and externals from the foot to metric system in the field, until I decided to have tables of these curve functions stereotyped for our own convenience. A collection of trigonometric and curve formulas was added and a condensed table of chords to a radius 1. for protracting.

The radii are computed for 20 m. chords down to a radius of 100 m. and for half chain or 10 m. chords for all curves of less than 100 m. radius. This arrangement provides for the use of short chords in tight places where most needed and keeps the corrections to be added when reducing tangents and externals of a 1° curve, for sharper curves, so small that interpolations are readily made mentally. I have copies of these tables on hand which I will mail to interested engineers and instrument men on application. The size of the leaves is about 4x6½ in., so they may be readily fastened into the ordinary field book.

H. H. FILLEY.

Weight and Tractive Power of M. Mallet's Largest Locomotive.

30 Avenue Trudaine,
Paris, Dec. 9, 1898.

To the Editor of the Railroad Gazette:

Referring to your article on the two heaviest locomotives of the 25th of November, I beg to point out an important omission in the table of the principal dimensions and weights of the engines, that is, their weight per driving axle.

That weight is for the American engine

$$\frac{208{,}000}{4} = 52{,}000 \text{ lbs.}$$

and for the Belgian one, built after my own system, in fact, it is an enlarged copy of the Gothard locomotive (see Railroad Gazette, 1890, page 569), the same weight is only

$$\frac{218{,}255}{6} = 36{,}400 \text{ lbs.}$$

or 70 per cent. of the first. The engine can consequently accommodate itself to a lighter track; or if the track is able to bear as much as 52,000 lbs. per axle, as is the case with the American locomotive, the total weight would be increased to $52{,}000 \times 6 = 312{,}000$ lbs. I believe any commentary useless.

I am in the habit of calculating the maximum tractive power of four-cylinder locomotives with the formula

$$\frac{pd^2s}{D}$$

d = diameter of the h.p. cylinders. The tractive power of the Belgian locomotive will thus be found of 41,000 lbs., instead of 29,700 as you gave it. Very heavy freight locomotives are in course of construction in Europe with six driving axles, but with a separate tender. The weight of the Belgian engine in working order is 238,000 lbs., or nearly 40,000 per axle.

A. MALLET.

The Training and Advancement of the Railroad Staff.

St. Louis, Dec. 13, 1898.

To the Editor of the Railroad Gazette:

I desire to say that I have been requested to prepare a report for the next meeting of the International Railway Congress, to meet in Paris in 1900, on technical education of railroad employees, the official wording being as follows:

"Question XXXLV.: Technical Education of Railway Servants—Appointment and Promotion.

"A.—Attempts made by railway administrations to promote the technical education of their staff. Special schools for the technical staff. Primary schools for the children of railway employees and workmen.

"B.—Methods of testing the knowledge of railway servants. Appointment and promotion."

I desire, therefore, to ask anyone conversant with the subject, to transmit to me as soon as possible, full information as to any courses of instruction that they may be familiar with, and I shall take great pleasure in acknowledging receipt of the same. As some extended correspondence may be necessary, it is desirable that I have the first information in the immediate future.

A reporter on this question has been appointed from each of the European countries, that from Switzerland being the General Manager of the St. Gothard, and from England, Mr. George Gibbs, General Manager of the North Eastern Railway. I presume it would be the desire of all Americans interested in this subject that our report should be as complete as possible.

GEO. B. LEIGHTON.

Los Angeles Terminal Railway,
712 Rialto Building,
St Louis, Mo.

A Semaphore for "Section Clear but Station Blocked."

New York, Dec. 5, 1898.

To the Editor of the Railroad Gazette:

I have read your editorial of Oct. 7, under the title of "Three Lessons from England." I am pleased to note that you feel it necessary and desirable to devote considerable space to the subject of block signaling, and have considered your editorial very carefully. The letter of P. C. S. in your issue of Oct. 28 and your editorial entitled "The Meaning of a Stop Signal," obviate the necessity of taking up several points which I had in mind after digesting the editorial first mentioned. It seems to me that your conclusions of Oct. 28 are to the point, and that the essence of the whole matter is whether we can depend upon the home and distant signals to fully protect a train which is standing between the home signal and the block (the starting signal).* It seems to be the consensus of opinion that it is not safe for the operator (at B), to plunge to permit the cabin in the rear (A) to give a clear block signal until he (A) has first stopped the train and given notice to the engineman that a train is occupying the track between the home and block (starting) signals at the station in advance (B). I do not propose to question this decision, which has been the result of experience in operation, but rather to offer a distinctive signal to be used for the block signal where a home signal is also used.

Fig. B illustrates what the writer considers a proper method of signaling where a home signal is used; and it is proposed to offer the signal illustrated by Fig. A (1, 2 and 3) as a substitute for the single arm semaphore signal now used for blocking. This signal (which was described in the Railroad Gazette Dec. 11, 1896), has two arms on the same spindle, the front arm having a square end and the back arm a fishtail end. The signal is connected to the signal

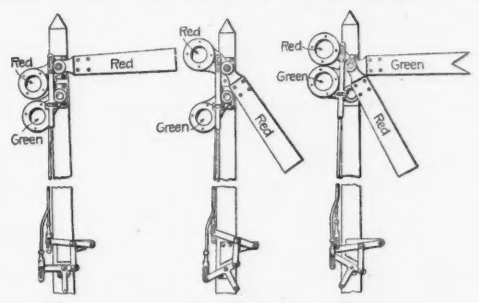


Fig. A.—Two-Arm Semaphore for Conditional Blocking.

cabin by a single line of pipe connections and is actuated by two levers in the interlocking machine. These levers are to be so arranged in relation to the block signal instrument as to make it impossible for the signalman to clear both arms while there is a train or any portion of a train on the main track or fouling it between the home and the block signal at the next station. It will also be impossible to clear either arm until the preceding train has passed the home signal at the station in advance. Of course, it is understood that unless continuous track circuit is used we cannot guard against leaving a portion of the train between the block and the home signal; and, this being clearly understood, it remains for the railroad installing the work to decide whether it will guard against this contingency by continuous circuit, or will be satisfied to have the assurance that the block signal cannot be cleared until the locomotive and all cars attached to it have passed beyond the home signal. The usefulness of this form of signal is the same whether continuous track circuit is or is not used.

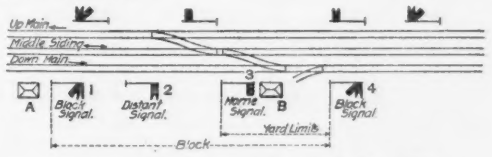


Fig. B.—Block Signaling with Two-Arm Signal.

The manipulation of this block signal will then be as follows: When a train or any portion of a train is fouling the main track between signals 3 and 4, the operator at B will plunge, freeing the lever operating the red arm at signal 1. The operator at A then reverses this lever and the signal appears as at 3, Fig. A. If no train or part of a train is fouling the main track between 1 and 4, the operator plunges for both the levers operating the block signal 1 and the operator at A is then in a position to clear both, and the signal will indicate as at 2. If a train has not passed signal 3 the operator cannot plunge, and consequently the signal remains at danger, as shown at 1.

If, when a train is fouling the main track between 3 and 4, it is desired to stop the train at A in order to give the engineman written instructions, in addition to the signal indication shown at 3, it may be done as it is now done, with the advantage, in the proposed plan, that a clear signal as shown at 2 cannot be given while there is a train or any portion of a train fouling the main track between signals 1 and 4. The attached form headed "Yard Limits Blocked,"† would cover this condition; but it seems hardly necessary. Some operating officials have, however, decided from their experience that an engineman will obey the instructions given by card better than he will obey the indications of a semaphore signal.

Referring again to the editorial of Oct. 28, you say: "Another American road had and we believe now has a rule requiring signalmen to make sure that the first train is 900 ft. beyond the home signal before giving the next train the right to come to the home signal." The proper way to insure the observance of this rule is to so design and install the block signals as to prevent the signalman from clearing the signal until the train is at a predetermined distance from the signal. If this was the practice in England the accidents recorded would not have occurred.

It is claimed by some that it is impossible to maintain a track circuit that can be depended upon; our experience satisfies us that it can be and is being done on many roads at very slight cost. It is thought by many that the lock and block system as operated in Great Britain is superior to that used in the United States; it will be found, however, that the latest improvements in the art as developed in this country supply a more complete system than is found elsewhere, and that while the managers of English railroads advocate considerably larger expenditures for the perfection of their block signal than is authorized in the United States, we find that better results could be secured with the same expenditure by employing the latest practice advocated by the Signal Engineers of the United States, who have given the subject careful consideration. Following your editorial of Oct. 7 it may be interesting to analyze more definitely a few of the accidents which have occurred in Great Britain during the last year.

CHARLES HANSEL.

[Mr. Hansel's analysis of English accidents is postponed to a future date.—Editor.]

* Mr. Hansel uses "block signal" to designate the starting signal, following what he understands to be the nomenclature of the American Railway Association.

† YARD LIMITS BLOCKED

.....Block Station ... .
189 ..... M
To Enginemen:
Train No..... .....on ....
track. Signal cannot be clear on account of Yard Limits in advance being blocked.
..... Signalman.

Proceed expecting to find Distant and Home Signals Blocked. If distant and home signals are found clear proceed as if no "Yard Limits Blocked" card had been received.
..... Superintendent.

The Computation of the Deflection of Body and Truck Bolsters.

By William Kendrick Hatt.‡

It is a comparatively simple matter to find the deflection of a cantilever beam, loaded either with a uniform loading or with concentrated loads, when the cross section of the beam is the same throughout its length. However, when the deflection of a body bolster is desired we meet with a difficulty, due to the

‡ Professor of Applied Mechanics, Purdue University.

fact that the cross-section of the bolster (and therefore the moment of inertia of the section) is variable, and, moreover, the variation is of such a character that the relation of the moment of inertia at any point to the distance of that point from an assumed origin is a function not capable of a satisfactory algebraic expression. If, then, it is desired to derive a formula for the deflection of such a body bolster, it will be necessary to assume such a law of increase of the moment of inertia as will lend itself to simple algebraic expression, and will lead to a formula which will be exact enough for practical purposes. Such a formula is derived below for the case of uniform loading and for end loading. There also follows the description of a graphical process for drawing the curve into which the bolster will bend under any loading, from which curve the deflection at any point may be obtained. The graphical process is preferable in that complicated cases are as easy to treat as simple ones. The bolster to which the following discussion refers is one with web and flanges; and not of the truss type.

Algebraic Solution:

Referring to Fig. 1, let AB be one-half of a body bolster and OB the curve into which the half-bolster is bent. Any point of this curve is located with reference to O by its co-ordinates x y; mn is a section of the bolster distant x from O; l is half the length of the bolster. Let I_0 be the moment of inertia at A, I^1 the moment of inertia at B and I the moment of inertia at the variable section mn.

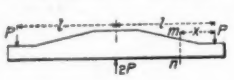


Fig. 4.

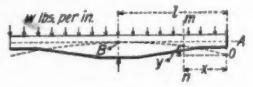


Fig. 1.

Assume the bolster to be uniformly loaded, to be supported at a point and also assume that the moment of inertia I at mn

$$= I_0 + \left(\frac{I^1 - I_0}{l}\right)x;$$

that is, the moment of inertia increases directly as x increases. The degree of error involved in these assumptions will be determined later.

One expression for the moment of the elastic forces acting in any section, as given in works on mechanics is, $\pm E I \frac{d^2 y}{d x^2}$ where E is the modulus of elasticity.

Equating this moment to the moment of the external forces about the neutral axis of section mn, we find

$$+ E I \frac{d^2 y}{d x^2} = -\frac{w x^2}{2}$$

$$\text{or, } E \frac{d^2 y}{d x^2} = -\frac{w}{2} \cdot \frac{x^2}{I} = -\frac{w}{2} \cdot \frac{x^2}{I_0 + \left(\frac{I^1 - I_0}{l}\right)x}.$$

Dividing the numerator of the fraction by the denominator, integrating twice and determining the value of the constants,** we find

$$E y = \tfrac{1}{6} \frac{w l^4}{I^1 - I_0} \left\{ n \left[\tfrac{1}{2} - C + C^2 \left\{ 1 + \log_e \left(\frac{1 + C}{n + C} \right) \right\} \right] + C^3 \log_e \left(\frac{C}{n + C} \right) + \frac{C n^2}{2} - \frac{n^3}{6} \right\} \quad \ldots\ldots\ldots (A)$$

where $n = \frac{x}{l}$, and $C = \frac{I_0}{(I^1 - I_0)}$.

When n = 1,

$$E y = \frac{w l^4}{2 (I^1 - I_0)} \left\{ \tfrac{1}{3} - \frac{C}{2} + C^2 + C^3 [\log_e I_0 - \log_e I^1] \right\}$$

When $n = 1$ and $I_0 = 0$,

$E y = \frac{w l^4}{6 I^1}$, and when $n = 1$ and $I_0 = I^1$ the expression becomes indeterminate and evaluates to $E y = \frac{w l^4}{8 I^1}$.

Graphical method:

Referring to Fig. 2, we see that the shear, J, acting at any section

$$= \int w \, d x.$$

Since wdx is a product of w, a loading intensity (which is expressed as a vertical height in the load diagram), by dx an elementary length along the horizontal, evidently wdx is the area of a small vertical strip of the load diagram. Then $\int w \, d x$ would mean the addition of all such vertical strips between two indefinite points. Thus, to obtain the shear in any section mn, we find the area of the load diagram up to that section; and we may draw a second diagram called the shear diagram, any ordinate of which is proportional to the shear and to the area in the load diagram to the right of mn.

It is shown in works on mechanics that $J = \frac{d M}{d x}$, the rate of increase of the bending moment with respect to x. That is

$$\int J \, d x = M$$

By similar reasoning to that above, we find that a moment diagram may be drawn, such that the ordinate at any point is proportional to the area of the shear diagram to the right of that point.

It is also shown in works on mechanics that

$$M = E I \frac{d^2 y}{d x^2}, \text{ or } \int M \, d x$$

$$= E I \left(\frac{d y}{d x} + C \right) = E I (i + C),$$

if I is constant. Here C is a constant of integration. Thus i, the slope, or grade, of the elastic curve at any point, is proportional to the area of the moment diagram up to that point; and we may derive a slope diagram from the moment diagram just as the moment diagram was derived from the shear diagram.

If I is not constant, then we must draw a new curve whose ordinates are $\frac{M}{I}$, and use these $\frac{M}{I}$ ordinates just as we used the M ordinates, in the case where I was constant; that is $\int \left(\frac{M}{I}\right) d x = E (i + C)$. The ordinate at any point of the slope curve is thus proportional to the area of the $\frac{M}{I}$ curve to the right of that point.

Since, $i E = \frac{d y}{d x} E$, then

$$\int i E \, d x = \int E \, d y = E (y + C^1),$$

and thus the ordinate y to the elastic curve at any point is proportional to the area of the slope diagram up to that point.†

We thus see that the five curves of load, shear, moment, slope and deflection are so related that each curve is derived from the previous one by a process of graphical integration, and with proper regard to scales we may obtain the deflection. Such a graphical process is shown in Fig. 3, which is the diagram for a body bolster used for treatment by the formula previously given. In the graphical treatment, however, concentrated loadings have been selected.

In the case shown in Fig. 3, the moment diagram, No. 2, was drawn directly from numerical computation. Then the curve No. 3 was drawn, using for the vertical scale one space equal to 5,000 units of the ratio $\frac{M}{I}$. Since one horizontal space is equal to 5 in., evidently, one square space of No. 3 equals $25{,}000 \frac{M}{I}$ in. units $\left(= \frac{\text{lbs.}}{(\text{in.})^2} \right)$.

Diagram No. 4 was obtained by drawing at selected points ordinates which were proportional to the number of square spaces in the area of diagram No. 3 to the right of such ordinates. The ordinates of No. 4 are not proportional to the slope directly, but are proportional to (i + C). Now, at the center of the bolster the slope of the elastic curve is zero, i. e., the tangent to the elastic curve is horizontal, or i = o. Consequently, the total height of No. 4 at the center of the bolster must be the value of C E. And thus we are led to see that the lengths shown above the curve are proportional to i E. No. 5, the shape of the bent bolster, was obtained by drawing, at selected points, ordinates proportional to the area of the upper part of No. 4. One vertical space of No. 4 equals two square spaces of the area of No. 3, or $50{,}000 \frac{\text{lbs.}}{(\text{in.})^2}$ units, and one square space of No. 4 thus becomes equal to $250{,}000 \frac{\text{lbs.}}{\text{in.}}$ units. One vertical space of No. 5 equals five square spaces of the area of No. 4, or 1,250,000 E y units.

Arithmetical Process:

Those who find arithmetical processes more convenient than graphical processes will be able to perform these operations of adding up partial areas by using successive columns of figures. Indeed, time will be saved by the arithmetical method.

For numerical treatment, the half-bolster has been divided into lengths of four inches, so that between the numbers in column headed "x" there is an interval of four inches, i. e., $\Delta x = 4$ in. The loadings occur at odd intervals.

The table is evidently a statement of the values of the ordinates to the different diagrams in Fig. 3. Since a 4-in. interval was used, columns 4 and 6 will be one-fourth the true values; columns 7 and 8 will be one-sixteenth, and columns 9 and 10 one-sixty-fourth their true values. The operations of tabulation are to be interpreted by reference to the diagrams in Fig. 3.

TABLE—EXAMPLE OF ARITHMETICAL PROCESS.

Body bolster, the same as was treated by the graphical method, loaded with 10,000 lbs. concentrated loads (Fig. 3); half length, 53 in.; side bearings, 23 in. from end; division points at 4 in. intervals from end; E = 30,000,000.

Distance from end x.	Load.	Shear.	M ÷ 4.	I	$\frac{M \div 4.}{I}$	(i + C) E ÷ 16.	i E ÷ 16.	(y + C^1) E ÷ 64.	y E ÷ 64.
0	0	0	0	28	0	0	15,006	0	128,226
+¾	10,000	10,000	0	28	0	0	15,006	11,254	116,972
1	0	10,000	2,500	28	89.2	11.1	14,995	15,004	113,222
2	0	10,000	12,500	28	446.3	278 8	14,727	29 865	98,361
3	0	10,000	22.500	32	703.1	853.8	14,152	44,304	83.922
4	0	10,000	32.500	38	855.3	1,632.7	13,373	58,066	70,160
5	0	10,000	42,500	44	965.9	2 543.3	12 462	70,984	57,242
+¾	10,000	...	...	...	...	...	...	...	...
6	0	20,000	58,750	52	1,129.8	3,591.1	11,415	82,922	45,304
7	0	20,000	78,750	60	1 312.5	4,812.2	10,194	93,726	34,500
8	0	20,000	98,750	72	1,371.5	6,154 2	8,851	103,248	24,978
+¼	10,000	...	...	...	...	...	...	...	...
9	0	30,000	126,250	86	1,468.6	7,573.9	7,432	111,390	16,836
10	0	30,000	156,250	100	1,562.5	9,089.1	5.917	118,064	10,162
11	0	30,000	186,250	115	1,619.1	10,679.9	4,326	123,185	5,041
+⅜	10,000	...	...	...	...	...	...	...	...
12	0	40,000	222,500	115	1,934.8	12,456.8	2,549	126,522	1,604
+½	−40,000	...	...	...	...	...	...	...	...
13	0	0	242,500	115	2,108.7	14,478 5	527	128,160	66
+¼	0	0	242 500	115	2,108.7	15 005.7	0	128,226	0

By interpolation the value of Ey ÷ 64 at the side bearings (5 + ¾) is found to be 48,288, whence the deflection y = 0.103 in.; and in the same way the deflection at the end of the bolster is found to be 0.274 in.

Truck bolster:

The truck bolster may be treated as a cantilever, with a terminal load equal to one-half the center load and a length one-half the length of the bolster, as shown in Fig. 4.

$$\text{If } I = I_0 + \left(\frac{I^1 - I_0}{l}\right) x$$

$$\text{then, } E \frac{d^2 y}{d x^2} = -\frac{P x}{I} = -\frac{P x}{I_0 + \left(\frac{I^1 - I_0}{l}\right)}$$

Integrating this equation twice and determining the value of the constants,‡ it becomes

$$E y = \frac{P l^3}{I^1 - I_0} \left[n \left\{ 1 - C \left(\log_e \left(\frac{1 + C}{n + C} \right) + 1 \right) \right\} - C^2 \log_e \frac{C}{C + n} - \frac{n^2}{2} \right] \quad \ldots\ldots\ldots (B)$$

Where $n = \frac{x}{l}$ and $C = \frac{I_0}{I^1 - I_0}$.

When n = 1,

$$E y = \frac{P l^3}{I^1 - I_0} \left\{ \frac{1}{2} - C + C^2 (\log_e l^1 - \log_e I_0) \right\}.$$

If $I_0 = o$ and $n = 1$

$$E y = \frac{1}{2} \frac{P l^3}{I^1}$$

When $I^1 = I_0$ and $n = 1$, the equation becomes an indeterminate form which evaluates to $y = \frac{1}{3} \frac{P l^3}{E I_0}$; which is a well-known formula.

** *Process of Integration:*

$$E \frac{d^2 y}{d x^2} = -\frac{w x^2}{2 \left(I_0 + \frac{I^1 - I_0}{l} x \right)} = -\frac{w x^2}{2 (I_0 + K x}$$

$$= -\frac{w}{2 K} \left(x - \frac{I_0}{K} + \frac{I_0^2}{K (I_0 + K x)} \right)$$

$$E \frac{d y}{d x} = -\frac{w}{2 K} \left(\frac{x^2}{2} - \frac{I_0}{K} x + \frac{I_0^2}{K^2} \log_e (I_0 + K x) \right) + C_0$$

since $x = l$; $\frac{d y}{d x} = o$

$$\therefore C_0 = +\frac{w}{2 K} \left(\frac{l^2}{2} - \frac{I_0}{K} l + \frac{I_0^2}{K^2} \log_e (I_0 + K l) \right)$$

$$E \frac{d y}{d x} = +\frac{w}{2 K} \left(\frac{l^2}{2} - \frac{I_0}{K} l + \frac{I_0^2}{K_2} \log_e (I_0 + K l) - \frac{x^2}{2} + \frac{I_0}{K} x - \frac{I_0^2}{K^2} \log_e (I_0 + K x) \right)$$

$$E y = \frac{w}{2 K} \left(\frac{l^2}{2} x - \frac{I_0}{K} l x + \frac{I_0^2}{K^2} \log_e (I_0 + K l) x - \frac{x^3}{6} + \frac{I_0 x^2}{K 2} - \frac{I_0^2}{K^3} \left\{ (I_0 + K x) \log_e (I_0 + K x) - K x \right\} + C^1 \right.$$

Since $x = 0$, $y = 0$ $\therefore C^1 = +\frac{w}{2 K} \left[\frac{I_0^3}{K^3} \log_e I_0 \right]$

putting $x = n l$, $C = \frac{I_0}{I^1 - I_0}$ and $K = \frac{I^1 - I_0}{l}$ and this expression reduces to formula (A) above.

† Those familiar with graphical statics of parallel forces will recognize the utility of the equilibrium polygon in drawing the deflection curve directly from the $\frac{M}{I}$ diagram.

‡ *Process of integration.*

$$E \frac{d^2 y}{d x^2} = -\frac{P x}{\frac{I_0 + I^1 - I_0}{2} x} = -\frac{P x}{I_0 + K x} = -\frac{P}{K} \left[1 - \frac{I_0}{(K x + I_0)} \right]$$

$$E \frac{d y}{d x} = -\frac{P}{K} \left[x - \frac{I_0}{K} \log_e (K x + I_0) \right] + C_0$$

when $x = l$, $\frac{d y}{d x} = o$ $\therefore C_0 = +\frac{P}{K} \left[l - \frac{I_0}{K} \log_e (K l + I_0) \right]$

$$E \frac{d y}{d x} = +\frac{P}{K} \left[l - \frac{I_0}{K} \log_e (I_0 + K l) - x + \frac{I_0}{K} \log_e (K x + I_0) \right]$$

$$E y = +\frac{P}{K} \left[\frac{l x}{2} - \frac{I_0}{K} \log_e (I_0 + K l) . x - \frac{x^2}{2} + \frac{I_0}{K^2} \left\{ (K x + I_0) \log_e (K x + I_0) - K x \right\} \right] + C^1$$

when $x = o$ $y = o$ $\therefore C^1 = -\frac{P}{K} \frac{I_0^2}{K^2} \log_e I_0$

$$E y = \frac{P}{K} \left[\frac{l x}{2} - \frac{I_0}{K} \log_e (I_0 + K l) x - \frac{x^2}{2} + \frac{I_0}{K^2} \left\{ (K x + I_0) \log_e (K x + I_0) - K x \right\} - \frac{I_0^2}{K^2} \log_e I_0 \right]$$

put $x = n l$ and $K = \frac{I^1 - I_0}{l}$ and $C = \frac{I_0}{I^1 - I_0}$ and this expression reduces to formula (B) above.

Having derived formulæ for body and truck bolsters of specified shape and loading, and having explained a graphical method for finding the deflection of such bolsters of any shape and any loading, it remains to compare the results of the application of the formula to certain beams with the results of tests on the same beams, and to examine the stiffness of certain forms of beams.

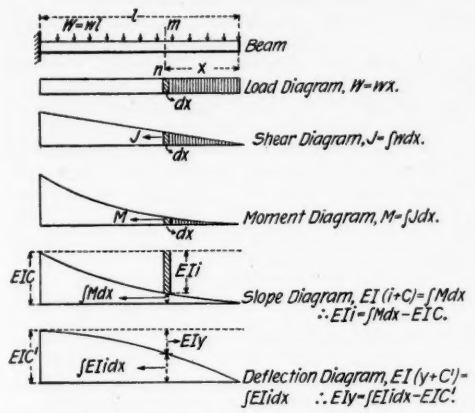


Fig. 2.—Graphical Methods for Bolster Computations.

Applying the formula (A) to a body bolster where $I^1 = 115$, $I_0 = 28$, $l = 53$ in., n for the side bearing $= 2\frac{3}{8}$, and $E = 30{,}000{,}000$, we find, for $w = 750$ lbs. per running inch, that the deflection at the side bearing equals 0.117 in., and that at the end of the bolster the deflection equals 0.268 in. By the graphical method the side bearing and end deflection are respectively 0.108 in. and 0.266 in. as compared with 0.117 in. and 0.268 as above. The agreement is thus quite close.

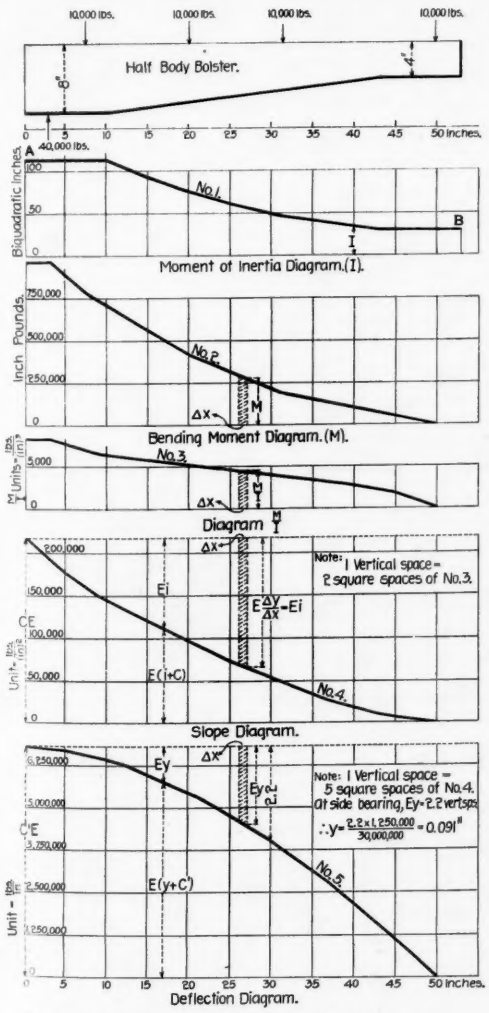


Fig 3.—Diagrams for Deflection of a Body Bolster.

The question arises: Will the assumption of uniform loading give results very different from those obtained with the actual concentrations? A graphical process applied to the beam described above, using actual concentrations of 10,000 lbs., each spaced as shown in Fig. 3, gave deflections of 0.106 in. and 0.256 in. at the side bearings and end respectively, as compared with 0.108 in. and 0.266 under a uniform load of the same total amount.

Another question: Does the assumption that $I = I_0 + \left(\frac{I^1 - I_0}{l}\right) x$, or the assumption of a uniformly increasing moment of inertia, introduce much error? The assumption is equivalent to drawing a straight line between the points A and B of curve No. 1 in Fig. 3. The writer could detect no difference in deflection amounting to one-hundredth of an inch between the results from the true inertia curve and the assumed inertia curve for the case tried.

The same beam was placed in the testing machine, and loads of 10,000 lbs. each were successively placed at the points indicated in Fig. 3. One load was applied near the end, and the deflection at the side bearings was measured; the next load was applied at intermediate sill, and the deflection again measured. We are able to make the assumption that, within the elastic limit, the combined effect of the loads acting together is equal to the sum of their separate effects. This deflection at the side bearing by actual test was 0.115 in., not sensibly different from that computed by the formula. So close an agreement might not have been expected.

The following table summarizes the results:

	Deflection of body bolster in inches at		Conditions.
	Side Bearings	End	
By formula (A)	0.117	0.268	Uniform load ; assumed I.
By actual trial	0 115	.....	Concentrations; real I.
By graphical method	0 108	0.266	Uniform load; real I.
" " "	0.108	0 266	Uniform load ; assumed I.
" " "	0 091*	0.259*	Concentrations; real I.
" " "	0.106	0.256	Concentrations; assumed I.

The values marked * are smaller than the others, since the reaction at the center bearing was taken to act at a point 3 in. from the center.

If the beam considered above were of the same depth throughout, equal to the depth at the center, the deflection at the end would be $\frac{1}{6}\frac{w\,l^4}{E\,I^1}$, or 0.280 in. If we suppose the end depth to be zero, the end deflection would be $\frac{1}{6}\frac{w\,l^4}{E\,I^1}$, or 0.280 in. The real deflection is intermediate between these two values; it is about 95 per cent. of that given by the formula $\frac{1}{6}\frac{w\,l^4}{E\,I^1}$. The deflection at the side bearing is about 43 per cent. of the end deflection, and is thus about $\frac{1}{15}\frac{w\,l^4}{E\,I^1}$. The latter expression might be used for most practical purposes.

It may be remarked that the deflection by test of many forms of bolster will be greater than that computed from these formulæ, because of the looseness of parts of these bolsters. That is, the formula takes account only of the elastic deflection due to bending, and not of the in-elastic deflection. In the case of built-up bolsters of I section there will be a slight additional deflection due to shear; that is, due to the vertical sliding on each other of the vertical sections. This latter would not be more than one-fifth the deflection given by the above formula. Because of the in-elastic deflection we may find that the method of putting together the material of the section will influence the deflection as well as the size of the section. There would be no appreciable in-elastic deflection in the case of a bolster made of I beams; whereas, in the case of a bolster composed of parts riveted together, this in-elastic deflection may amount to one-third the total deflection. A review of the stiffness of the body and truck bolsters now in use discloses the fact that these parts, designed for the same service, differ in their capacity to withstand the loads put upon them to such a large extent that their design would seem to be controlled by the judgment of the designer rather than by any formal computation. The same thing is true of brake beams, which vary in stiffness (extreme range), as fifteen to one; and in strength as thirty-five to ten.

The Block System on the Atchison.

The Atchison, Topeka & Santa Fe now has about 750 miles of its lines equipped and manned for running trains by space interval, and 167 miles more will soon be equipped. General Superintendent H. U. Mudge has given us the following details of the regulations under which trains are run, with facts of interest concerning the apparatus and the results of the change.

The Atchison, Topeka & Santa Fe is now equipped with the telegraphic block signal system from Double Track Junction, 11.5 miles west of Chicago, to Sheffield, 8 miles east of Kansas City Union Depot; from Holliday, Kan., to Newton, via Topeka and main line, and from Holliday to Emporia Junction, on Emporia branch, which runs via North Ottawa. The double track from A. T. & S. F. junction, in Kansas City, to Holliday, 12 miles, is equipped with Hall automatic electric block signals, and the Raton tunnel, in New Mexico, is also equipped with the Hall automatic electric absolute block. The line between Bee Creek Junction and Terminal Yard, on the St. Joseph branch, 7.7 miles, is operated under the staff system, this track being used by two tenant lines, having an average service of 30 trains a day. The mileage worked under the telegraph block signal system is as follows, with cost of construction of signals, etc.:

	Miles.	Block Offices.	Cost.
Chicago Division:			
Double Track Jct. to Sheffield.....	139.4	98	$16,000
Eastern Division:			
Holliday to Emporia, via Main Line...	114.7	21	2,226
Holliday to Emp. Jct., via Emporia Br.	98.4	20	2,838
Middle Division:			
Emporia to Newton.....	72.1	14	2,027
Totals	725.6	153	$23,091

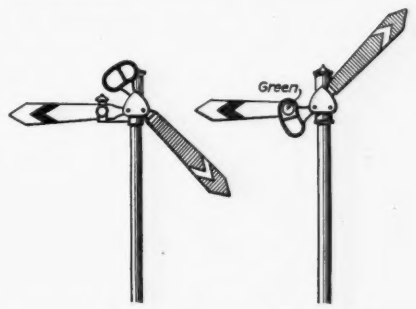
The Chicago Division is equipped with three-position signals, the arms for both eastbound and westbound on the same post. The Eastern and Middle divisions are equipped with two-position signals. Of the total 153 block offices, 14 have telephone connection only. These fourteen are located at unimportant passing tracks and are run the same as telegraph offices, except that telephones are used instead of telegraph instruments.

In establishing the block system it was necessary to open 23 new offices, and 21 additional day operators and 45 additional night operators were employed. At present there are 10 day offices that are closed at night. This will vary according to the business. All of the night offices are day offices also. The average pay of telegraph operators is $45; telephone operators, $35. The increases in payrolls to operate the telegraph block were as follows:

Chicago Division	$2,620	monthly
Eastern Division.....	1,300	"
Middle Division.....	450	"
Total	$4,370	"

The average length of the blocks on all three divisions is five miles. The longest block is eight miles, although when business is dull some intervening offices may be closed at night, making blocks as long as 10 miles; but ordinarily the longest block does not exceed seven miles.

The standard signal post is of iron pipe, 32 ft. long, set in a concrete base, which is inclosed in a 12 in. vitrified sewer tile, making the structure as permanent as possible. The Chicago Division is equipped with these posts. West of Kansas City wooden posts were erected in the beginning. Fittings for the home signals were furnished by the Union Switch & Signal Company, of Swissvale, Pa., and are the design of that company's Chief Engineer, Mr. J. P. Coleman. The standard semaphore blade is used, two blades on each post, governing trains in either direction. Pipe connections are used. The signal is so designed that should any connection break or become disconnected the arm will go to horizontal or stop position from either the clear or the caution position. With the three-position signal the permissive signal is indicated by inclining the semaphore blade upward at an angle of 60 degrees.



Clear. Permissive.

Three-Position Semaphore for Block Signaling—Atchison, Topeka & Santa Fe.

At stations where the view of the home signals is obscured by curves or obstructions distant signals are used. These distant signals are of standard type, such as are employed at interlockings, and all the fittings are made at the company's shops at Topeka. The iron posts for both home and distant signals are furnished by the Pennsylvania Tube Works, of Pittsburgh, Pa. When no distant signal is used the signal is operated by a short lever on the operator's desk. Where distant signals are used all the signals are operated by long levers similar to those used to handle interlocking signals.

The rules provide for permissive blocking for freight trains following one another and for passenger trains following freight trains (but this only in a few cases where blocks are long and grade ascending), but never for passenger trains to follow each other or for freight trains to follow passenger trains. Permissive blocking is practiced only where the traffic is so heavy that it cannot be avoided. Where three-position signals are used permission to follow another train in the block is given by the upward inclination of the semaphore or by green light at night. Where two-position signals are used permissive cards are issued. The dispatcher controls the giving of permissive cards or signals, but does not give the operator specific orders in each case.

In addition to the signals here described, the Atchison expects within the next three months to erect three-position signals at 30 stations on the Oklahoma Division, from Winfield to Purcell, a distance of 167 miles. There will be six distant signals.

The heaviest freight traffic on any single track line of the Atchison is that on the Emporia branch, where as many as 60 freight trains have been moved in 24 hours. On the whole, it is believed that trains are not delayed any more under the block system than under the time interval, and in a number of cases collisions have been prevented. The permissive system has been successfully managed thus far, with no accidents. Responsibility for collision rests with the following train. During snowstorms and fogs the instructions are to use the absolute block. It is believed that the fast passenger trains make time easier under the block system than before it was adopted.

Revised rules for the block signals were issued by Superintendent Mudge in October last. There is a chapter of definitions, like that in the Standard Code of the American Railroad Association. A clear block signal indicates that the track is clear to a point 1,000 ft. before reaching the next "home block signal." Rule 17 says that the use of the block system does not in any way relieve trainmen from flagging at all times, according to the general rule. Rule 23 reads: "A home block signal must be restored to the 'stop' indication after having been changed for a train, as soon as the rear car carrying the markers has passed the signal, if the train stops; and if it does not stop, as soon as the markers are 300 feet beyond the signal." A distant signal must not be restored to the caution indication until after the rear car carrying the markers has passed the signal. To send forward an eastbound train a block signal operator must simply see that the block is clear and that he has no order on hand to hold eastbound for westbound trains. To send forward a westbound train he must say to the operator at the other end (for example): "B. E. for No. 1," which means block all eastbound trains for westbound train No. 1. The operator receiving this order enters train No. 1 on his register and then responds: "I 13 B. E. for No. 1," signing his personal and office call.

From Trade to Profession—Advances in American Railroad Location.

By William G. Raymond.*

IV.—EQUATING VALUES.

In this paper it will not be attempted to introduce new principles, but rather to restate some old ones in concise form, and to furnish late and what is hoped are reliable figures for comparing various routes.

The two considerations that practically determine the general route are business and ruling grade. Cost of construction, climatic differences, length of line, amount of curvature, and rise and fall, all, theoretically, enter into the problem; but it is a fact that under ordinary circumstances the first two named elements control the selection. The other items enter to confirm or to show total differences in value of different lines, or to decide when differences in business or ruling grade are very small.

Bearing this in mind: 1. Of two or more lines of the same ruling grade, select that of most business in sight. 2. Of two or more lines of approximately the same apparent business, select that having the lowest ruling grade. 3. If both business and ruling grade vary, consider proportionate additions to business as worth three times an equal proportionate increase in train load due to lower ruling grade. This does not mean, as intimated in one text-book, an equal proportionate decrease in number of trains. It means that if one line seems to offer 1 per cent. more business than another which affords grades on which 3 per cent. heavier loads can be hauled than on the first line, the two lines are of approximately equal value. The rule is a rough one, and probably errs in attaching too little importance to business. On the other hand, if the bulk of the business immediately available is to be through business, which will undoubtedly become, if it is not at once, competitive, ruling grade at once becomes a vastly more important item. In such matters definite figures can not be given applicable to even a few cases, and individual judgment must be exercised.

It must also be remembered that by the ruling grade is not meant the single steepest grade, which may possibly be operated by assistant power, nor the ruling grade of a single division of the line, if the line is long enough to have several divisions, but the grade that fixes the weight of train that can be hauled over the entire road, breaking the train occasionally, if necessary, or using helpers.

To find the load in net tons that a given locomotive can haul up a given grade of r per cent. at ordinary freight speed, the following equation is used. In this equation L is the load in net tons that can be hauled behind the tender, E is the weight in net tons of the locomotive and tender, and W is the weight, also in net tons, on the drivers:

$$L = \frac{10\,W}{1 + 4\,r} - E$$

This equation is based on a rolling resistance of 5 pounds per ton on straight level track, which is probably an ample allowance for ordinary summer weather. An allowance of about 20 per cent. must be made in winter in northern latitudes for working loads, because the coefficient of adhesion, taken at one-fourth in the equation, probably often drops to one-fifth. One text-book says that such a load as is obtained from the foregoing equation may not always be considered, because the steam-making power of the locomotive may be insufficient if the hill be a long one. With modern notions of locomotive design the steam-making power of the machine is not likely to be deficient.

The same rules that apply to the line as a whole apply to single divisions.

If two lines seem to be about equally worthy, measured by business and ruling grade, the final decision may be reached by considering the other elements of the problem, as indicated in what follows.

When the general route is determined, the location must be put on the ground and studied in detail. Since the cheapest possible line, mile for mile, is that line which lies at all points on the surface of the ground, and since such a line is manifestly impossible, it becomes necessary, in order to compare details of location, to know the cost of earthwork and superstructure, of rise and fall, curvature and distance. Figures for estimating cost of construction are plentiful, and hence there will be given here only those less frequently seen in print. As a basis for comparison, the locating engineer formulates a statement showing how much may be expended to throw out one foot, or one mile, of distance, one foot of rise and fall, or one degree of curvature, on the particular line adopted. To do this he first estimates the probable traffic in daily trains, and the cost of handling a train mile, as a basis to work from. He then applies his own knowledge, derived from experience, or from such a set of figures as will presently be given, and determines the required values.

Thus, at a cost of one dollar per train mile, the annual cost of one degree of curvature per daily train both ways may be fairly estimated at $0.355, which sum, multiplied by the probable number of daily trains both ways, that is by 10 if there are 10 trains each way, and capitalized at the rate of interest that must be paid for money, gives the gross cost of one degree of curvature on the particular road under consideration, or the sum beyond which it is improper to spend to save one degree of curvature.

The value of distance is not independent of the amount saved. For small savings, say under 3 miles of single track, the estimated cost is $0.40 per mile per train, or about $290.00 per annum per daily train round trip. For distances greater than 2 or 3 miles, but less than 8 or 10 miles, the cost is estimated at $0.45 per mile per train, or about $330.00 per annum per daily train round trip. For distances between 10 miles and, say, 50 miles, $0.75 may be estimated per mile per train, or about $550.00 per annum per daily train round trip. For greater distances than this, possibly necessitating an extra operating division, nearly the whole average cost, or, say, $0.90 per train mile, about $660.00 per annum per daily train round trip, must be estimated. But for any such additional length as 20 or more miles there would almost certainly be some offsetting advantage in increased revenue, which would very likely equal or exceed the extra cost attributable to it. At any rate this must be carefully considered in any particular case.

Rise and fall, like distance, is not constant in cost per foot. Its cost will, notwithstanding statements to the contrary, depend both on the amount in a single place and the rate of grade on which it occurs. On grades under 0.25 per cent., which is the grade of repose for five pounds resistance, there will be no appreciable cost of rise and fall, no matter how long the grade. If the grade is steeper than this, but the hill is short, making a rise of not more than 40 or 50 feet, and is worked by stored energy, that is, is approached with high velocity, which is partly converted into potential energy in climbing the hill, and is reconverted into velocity in descending, the hill not being long enough to require the use of brakes, there is no apparent loss of power, and little expense results from such a grade. As such a grade cannot always be worked by stored energy, and as brakes must sometimes be applied, and as there is some little extra expense in caring for roadbed and track, it will be fair to assign to such a hill a cost somewhere between that due to working it by stored energy and that due to working it entirely by extra fuel on the hill, and applying brakes on the descent.

*Professor of Geodesy and Road Engineering in the Rensselaer Polytechnic Institute.

TABLE II.

Distribution of Operating Expense of American Railroads. At $1.00 per Train Mile These Figures Become Cents per Train Mile.

Item.	Per cent. of whole expense.	
Maintenance of way and structures:		
Repairs of roadway	10.54	
Renewals of rails	1 43	
Renewals of ties	2.95	
Repair and renewals of bridges and culverts	2.22	
Repairs and renewals of fences, road crossings, signs and cattle guards	0.55	
Repairs and renewals of buildings and fixtures	1 76	
Repairs and renewals of docks and wharves	0.27	
Repairs and renewals of telegraph	0 13	
Stationery and printing	0.03	
Other expenses	0 37	
Total		20.25
Maintenance of equipment:		
Superintendence	0.83	
Repairs and renewals of locomotives	5.65	
Repairs and renewals of passenger cars	2 09	
Repairs and renewals of freight cars	6.83	
Repairs and renewals of work cars	0.15	
Repairs and renewals of marine equipment	0.17	
Repairs and renewals of shop machinery and tools	0 50	
Stationery and printing	0 04	
Other expenses	0.44	
Total		16.50
Conducting transportation:		
Superintendence	1 77	
Engine and roundhouse men	9.80	
Fuel for locomotives	9.80	
Water supply for locomotives	0.70	
Oil, tallow and waste for locomotives	0.39	
Other locomotive supplies	0.24	
Train service	8 00	
Train supplies and expenses	1 59	
Switchmen, flagmen and watchmen	4.23	
Telegraph expenses	2.03	
Station service	7 90	
Station supplies	0 81	
Switching charges—balance	0 37	
Car mileage—balance	2.10	
Hire of equipment	0.33	
Loss and damage	0.79	
Injuries to persons	0.87	
Clearing wrecks	0. 3	
Operating marine equipment	0.84	
Advertising	0 43	
Outside agencies	1.57	
Commissions	0 17	
Stock yards and elevators	0.13	
Rents for tracks, yards and terminals	1 79	
Rents for buildings and other property	0.52	
Stationery and printing	0 13	
Other expenses	0.57	
Total		58.50
General expenses:		
Salaries of general officers	1.25	
Salaries of clerks and attendants	1.45	
General office expenses and supplies	0.32	
Insurance	0 46	
Law expense	0.75	
Stationery and printing (general offices)	0 17	
Other expenses	0.35	
Total		4.75
Grand Total		100.00

TABLE I.

Annual Cost, per Daily Train Round Trip, of One Unit of Distance, Curvature, and Rise and Fall. Cost of Train Mile assumed at $1.00.

Distance. Cost per Mile.				Curvature Cost per Degree.	Rise and Fall. Cost per Foot.				
					Grades under 0.25%.	Grades over 0.25%. Under 50 ft. total rise in one place.	Grades bet. 0.25% and 0.75%. Over 50 ft. rise in one place.	Grades Exceeding 0.75% Over 50 ft. in one place.	
0 to 3 Miles.	3-10 Miles.	10-50 Miles.	Over 50 Miles.					Under 2%.	Over 2%.
$290.00	$330.00	$550.00	$660.00	$0.355*	0.00	$0.50	$1.80 × rate %.	$1.80	$2.00-$2.50

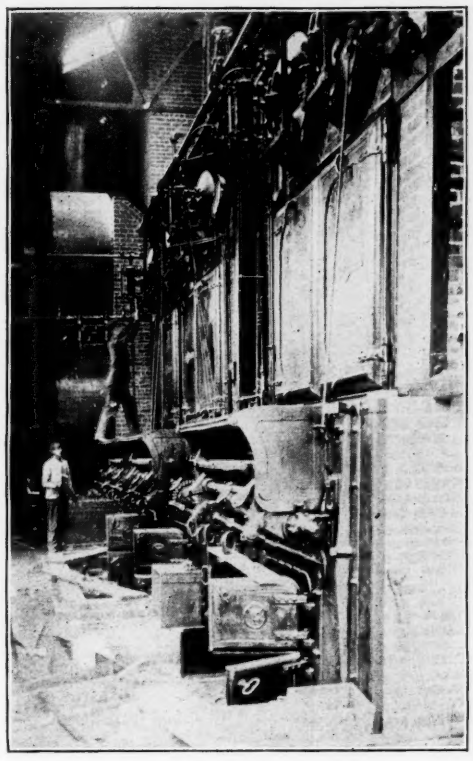
* Based on ½ pound curve resistance. With 1 pound resistance the cost is $0.408.

TABLE III.

Showing Portion of Several Expense Items that is assumed to vary more or less directly with Distance, Curvature and Rise and Fall. The amount varying is shown in cents per train unit and in per cent. of the whole item. Train mile $1.00.

Item.	Total cost of item (per train mile).	Distance (per train mile).								Curvature (per train degree).		Rise and Fall (per train foot).			
		0-3 miles.		3-10 miles.		10-50 miles.		Over 50 miles.				Under 50 feet in one place.		Over 50 feet in one place. Grades bet. 0.75% and 2%.	
		Cents.	%.	Cents.	%.	Cents.	%.	Cents.	%.	Cents.	%.	Cents.	%.	Cents.	%.
Maintenance of Way and Structures	20 25	12.34	61.0	16 50	81.5	19 00	93.9	20 25	100 00	0.0155	0.075	0.015	0.075	0.070	0.346
Maintenance of Equipment	13 50	5.30	52.2	5.30	32.2	14 00	85.0	15.00	91.00	0.0224	0 134	0.017	0 103	0.028	0 170
Conducting Transportation	9 80	4.20	42.9	4.20	42.9	5 00	51 1	8 50	86.8	0 0 84	0.086	0.037	0.378	0.148	1.512
Transportation Other Expense	48 70	18.16	37.2	19.00	39 1	37 00	76 1	45 50	93 6	0.0024	0 005	...	.....	.....	.....
General Expense	4.75	...	.....	..	.....	..	.....	.75	0.159	. ..		....	... ..	... ..	
Total	100.00	40.00	....	45.00	.....	75.00	.....	90 00	...	0.0487	....	0.069	....	0.246	.....

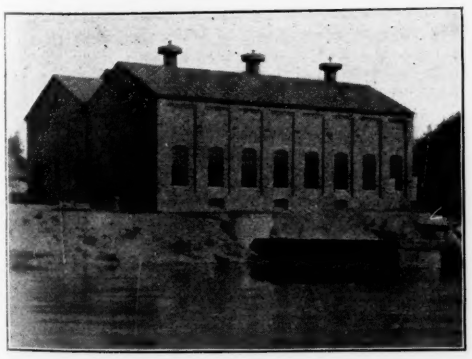
The cost will probably be less than a direct average. It will be assumed at 40 per cent. of the higher cost. On grades, then, of almost any rate between 0.25 per cent. or 0.3 per cent., when the hill does not exceed 40 feet to 50 feet in height, the cost per foot of rise and fall may be estimated at, say, $0.50 per year per daily train round trip. For hills higher than 40 feet to 50 feet the cost of rise and fall on low rate grades seems to vary with the rate, and may be put at $1.80 times the rate per cent. per foot per year per daily train round trip. This is for rates between 0.25 per cent. and about 0.75 per cent. For rates higher than this the cost may be taken at $1.80 per foot, independent of the rate, but when the rate exceeds 2.0 per cent., and brakes and sand must both be used on down grade, the cost probably reaches $2.00



Boiler Room of Power House.

or more. A summary of the preceding costs is given in Table 1.

Care should be taken in applying the figures to any given case. To estimate the cost of these various items for a proposed new line reference is usually had to the statistics of other lines more or less similarly conditioned. The differences of condition are noted, and an estimate of the probable train mile cost is made. This estimate is used in applying the figures of Table I. If the estimated cost of a train mile is 90 cents, 90 per cent. of the figures of the table is used. If the division of expenses is likely to be quite different from the average of the United States, on which the foregoing costs are based, due allowance must be made. As a guide to such work, two tables are appended—Table II. and Table III. One shows the average division of operating expense for the United States, as returned by the Interstate Commerce Commission. The other shows the portion of each main item that is assumed to vary more or less directly with distance, rise and fall, and curvature. By using these two tables and a knowledge of the amount and division of expenses on some road conditioned about like the one proposed, Table I. may be modified to suit the proposed line.



Power Station of the Detroit, Ypsilanti & Ann Arbor Railway.

Pusher service may be estimated at about $250.00 per year per mile of incline per daily train, if the assistant locomotives will have a chance to work to their full capacity of from 100 to 150 miles a day. This figure assumes but one helper per train. It is a rough estimate, but is thought to be sufficiently accurate for preliminary estimates.

In comparing two ruling grades, extra train mileage, caused by the higher grade or saved by the lower grade, may be taken at 40 per cent. of the estimated cost of train miles on the grade used as the basis of comparison. That is, at $1.00 per train mile on a 0.5 per cent. grade, that it is proposed to cut down to a 0.25 per cent. grade, the train miles to be saved may be estimated at 40 cents, not at $1.00. The relative number of trains for the same business on these two grades is as three to two. Hence if there are estimated 15 trains daily on the 0.5 grade, there will be for the same business, handled in maximum trains, 10 trains daily on the 0.25 grade. If the division is 100 miles long, there are saved 1,000 train miles daily. At 40 cents this is $400.00 daily saving. But not all business is handled in maximum trains, and an estimate must be made, or it must be known how much of the traffic can be so carried. In comparing two lines in this way, fractional trains will generally appear in the computations. It is right to use these fractions, because the figures are all averages of yearly operations, and not the actual trains run in any one day.

A brief statement of the methods of arriving at the figures given in this paper should, perhaps, be made. A full statement of all the reasoning would occupy altogether too much space.

First, all items of expense that cannot in any way be affected by small changes in distance, rise and fall, curvature, or extra trains, have been excluded. It has been noted that:

1. General expenses will not vary. 2. Switch engine mileage is nearly one-fourth of the whole train mileage, and the expense of this will not vary with small changes of the various items named, except extra trains. 3. Fuel must be divided between starting and stopping, radiation while running and while idle, kindling and banking fires, curvature, grades and distance simply. But switch engine fuel must first be deducted. 4. Car and locomotive repairs must be divided among curvature, grades, distance, starting and stopping, switching and time. 5. Train wages, except enginemen's and yardmen's wages, must be given wholly to distance. Enginemen's wages must be similarly treated after deducting switch enginemen's wages. 6. The division of track expense, roadway, rails and ties, each estimated separately, is between starting and stopping, curvature, grades, distance and time. Other minor items are distributed entirely by judgment. Indeed, much of all of the division is by judgment. No two persons would be likely to arrive at the same result, and these figures are submitted in the hope that they are as nearly correct as any others are likely to be, and more correct than those made before the knowledge of the various items of operating expense was as definite as now. That they may be open to criticism in some particulars is recognized, and such criticism will be welcomed as a means of determining better values.

A Model Interurban Electric Railroad.

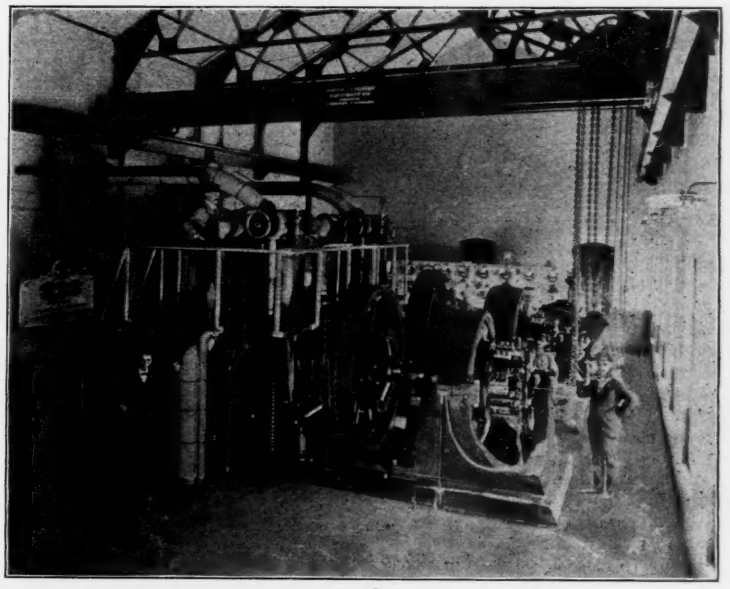
The Detroit, Ypsilanti & Ann Arbor Railway, connecting Detroit, Dearborn, Ypsilanti and Ann Arbor with a number of thriving towns through one of the most prosperous sections of the state of Michigan, is a remarkably high-class and well-built road, without extravagant and useless finish. Everything pertaining to this road is of the best quality, and every detail is designed to give the most reliable and best commercial results.

The overhead construction consists of double "figure 8" trolley wires, which, with booster and direct feeders, are so arranged as to give the most perfect distribution possible. The road is about 42 miles long, and the equipment consists of 10 large cars for through express, local and excursion service between Detroit and Ann Arbor, with several smaller cars for local service at Ann Arbor. These cars, one of which is illustrated, are over 40 ft. long, are extra wide and supplied with two trolley poles, and have Westinghouse air brakes. They were built by the Barney & Smith Car Company, of Dayton, Ohio. Each coach has four 50-h. p. standard Westinghouse railroad motors, of the well-known multipolar type, with iron-clad armatures.

The current is supplied from two power houses, about 20 miles apart; one is situated at Ypsilanti and the other at Dearborn. These power houses are alike, except in a few minor points. They are fireproof brick structures with double gables, forming independent boiler and engine rooms, being plain, substantial buildings, with just enough architectural effect to produce a pleasing appearance.

The machinery in each station consists of two 450-h. p. Westinghouse compound automatic engines directly connected by means of flexible spring couplings to Westinghouse 225-k. w. railroad generators, with foundations in place for two additional sets of machinery, and provision for extension of buildings for a further increase if required. Independent condensers are connected, so that the plants can be used either condensing or non-condensing. Each boiler room contains three water tube boilers of 250 nominal h. p. each, with Roney mechanical stokers, fuel economizers, duplicate feed water pumps and mechanical draft, using relay fans, all arranged compactly so as to require as few men as possible. The coal and ash handling machinery is not at present in place, but provision is made for this in connection with further increase of the plants.

The current to the distant portions of the line is conducted through feeders, in which there is a very considerable drop in pressure at the time of maximum load. Boosters are therefore used. These are simply Westinghouse series wound generators, driven by electric motors. The voltage to the feeder circuit is increased in proportion to the increases of load, resulting in a practically constant pressure at all points. It was found that this method was much more economical than it would be to supply the additional copper wire which would be required if the boosters were not used.



Interior of Power Station—Detroit, Ypsilanti & Ann Arbor Railway.

The switchboards are made of heavy marble panels with iron framework of very neat design, and are supplied with full supply of meters, circuit breakers, switches, and other apparatus for the complete control of current under all conditions.

The steam piping throughout the plants is designed to carry a working pressure of 175 lbs. The steam passes through large separators before going to the engines, and these separators are drained by steam loops, returning all condensing water direct to the boilers, all piping being thoroughly covered throughout. In each engine room there is a 15-ton traveling crane. Both plants are upon the river bank, where an ample supply of water is obtained. Filters are used at the Dearborn plant. The service of such a road, with a comparatively small number of heavy cars running at high speeds, throws a fluctuating load on the station's machinery, which was carefully selected to work economically under the variable loads. The economy of Westinghouse compound engines under a fluctuating load insures an economical steam consumption. In the boiler rooms mechanical draft is found to regulate most perfectly the rate of combustion. The speeds of the fans are controlled so as to meet demands for steam. By combining fuel economizers with mechanical draft, the temperature of the waste gases is low. By using the mechanical stokers, the cheapest grades of coal can be burned with minimum labor in firing.

Electric Car Running Between Ann Arbor and Detroit.

The plant was designed and built under the direction of Westinghouse, Church, Kerr & Co., who also furnished all of the machinery, including car equipments and air brakes. We are indebted to them for the accompanying engravings.

This road throughout has thus far proved a very successful undertaking. Westinghouse, Church, Kerr & Co. had engineers connected with the several Westinghouse interests on the ground for months studying all the conditions, in order that the plant, when completed, would be as near perfect as engineering skill could provide.

At the time the Westinghouse company took hold of the work, valuable franchises had been secured, and the value of the road, as an investment, was assured, but no engineering work had been done.

This part of the work, as well as that of furnishing all the machinery, was turned over to the engineering branches of the Westinghouse interests upon such a basis that the system might be arranged to meet the conditions from all standpoints rather than working to a set of specifications with the idea of following them rigidly to fulfill a contract, whether they proved the best or not. Through the method thus adopted, the officers of the road were entirely relieved of details, yet at the same time in close touch with all that was being done, while the entire responsibility was assumed by an engineering and contracting concern with a force of experienced men, and backed by large manufacturing industries.

The Powers of the Interstate Commerce Commission.

By General Basil W. Duke.

[Concluded from page 895.]

Those who oppose conferring on the Interstate Commerce Commission the power described in the bill now before Congress contend that it provides a method by which the Commission may ultimately be enabled to make all rates on interstate business; for, vast as is the field of railway service and the scope of its tariffs of charges, it will only be necessary that a certain number of cases shall be heard and determined, or that the Commission exercise its right of independent inquiry, and the rates published by the railroad companies may be entirely superseded by those fixed by the Commission. This result was foreseen by the Supreme Court, and intimated in the opinion just quoted from. The court said: "It must be borne in mind that the Commission is not limited in its inquiry and action to cases in which formal complaint has been made, but, under Section 13, 'may institute any inquiry on its own motion in the same manner and to the same effect as though complaint had been made.' . . . There is nothing in the act requiring the Commission to proceed singly against each railroad company for each supposed or alleged violation of the act. In this very case the order of the Commission was directed against a score or more of companies, and determined the maximum rates on half a dozen classes of freight from Cincinnati and Chicago respectively to several named southern points, and the territory contiguous thereto, so that if the power exists, as is claimed, there would be no escape from the conclusion that it would be within the discretion of the Commission of its motion to suggest that the interstate rates on all the roads in the country were unjust and unreasonable, notify the roads of such opinion, direct a hearing, and upon such hearing make one general order reaching to every road and covering every rate."

Really, when "the thing asked for" by the Commission is regarded in this aspect, it is no great matter of surprise that Mr. Walker should have used the language of which Mr. Prouty so indignantly complains, and declared that "the powers outlined in the report . . . cover all that the wildest advocate of a bureaucratic system could desire."

Mr. Prouty insists that in no way can the provision of the first section of the act, that all rates shall be just and reasonable, be made effective except by giving the Commission power to compel a rate that is just and reasonable.

Why, he asks, will a suit to compel a railroad company to repay to a party which it has charged an unreasonable rate, whatever sum may be in excess of a reasonable rate, be of no avail? Because, "The Interstate Commerce Act provides," he says, "that in case a person is damaged by a violation of that act, a suit for such damages may be begun either before the Commission or directly in the Circuit Court. In reference to the rates under consideration, certain persons, being in reality the same who are conducting the prosecution before the Commission, did bring suit in the proper Circuit Court for the recovery of the excess over and above a reasonable rate in case of shipments made before the filing of the complaint. The court in that case has recently held that the action will not lie, that the published rate is presumptively a reasonable rate, and the shipper cannot maintain an action to recover any part of that rate which he has paid. As the law stands to-day, therefore, there is absolutely no remedy for the exaction of an unreasonable freight charge. The Commission has no power to compel a reasonable rate for the future, and neither the courts nor the Commission have power to award damages for the exaction of an unreasonable rate in the past. Although the statute of the United States expressly declares that rates shall be just and reasonable, the carrier can with immunity in interstate traffic impose and collect without responsibility to anyone whatever rate it sees fit."

In order to show to what extent Mr. Prouty exaggerates his contention and how incorrectly he represents the remedial effect of the act, it is necessary to explain just what was decided in the case to which he refers. In that case, Van Patten vs. Chicago, Milwaukee & St. Paul Railway Co., 81 Federal Reporter, p. 545, the plaintiff alleged that a certain rate charged on carloads of grain shipped between the town of Manning, Iowa, and the city of Chicago was "an unjust, unreasonable and extortionate charge for such service, and subjected this plaintiff and the town of Manning to an undue, unjust and unreasonable prejudice, disadvantage and extortion and discrimination, all contrary to the provisions of the act of Congress approved Feb. 4, 1887, entitled 'An Act to Regulate Commerce' and the amendments thereto. That all of said rate in excess of 17 cents on corn and 20 cents on wheat, per 100 pounds, was unjust, unreasonable, extortionate and discriminating, and subjected plaintiff and said Manning to unjust and unreasonable prejudice and disadvantage." The defendant answered that ever since the passage of the act of Feb. 4, 1887, it had, in accordance with the requirements of that act, adopted schedules of rates, showing the charges established for the transportation of freight over its lines of railway; and had kept the same duly printed, posted up in its depots and offices, as required by the statute; and that the charges by it made for the transportation of the grain shipped by the plaintiff, as alleged in the petition, were in accordance with the schedule rates thus established, adopted and published, as required by the act; and that the shippers made their several shipments and paid the scheduled rates therefor without demur or protest. To the several paragraphs of the answer setting up these facts a demurrer was interposed, based upon the proposition that if the rate charged for the shipment of the grain was unreasonable, it was no defence to show that the rate charged and paid was the schedule rate. The demurrer was overruled.

The court, in an elaborate opinion, reviewed the causes and considerations which induced Congress to undertake legislation with the view of regulating interstate commerce, recited the various sections of the act, and called attention to the language of Section 9, providing for the institution of suits in the courts of the United States for the recovery of damages to which common carriers may be liable under the provisions of the act. "To sustain a recovery under this section," said the court, "it must appear that the damages arise from a violation of the provisions of the act, and therefore, when the right to recover damages is based upon the averment that a given rate exacted of a shipper is unreasonable, we must have regard to the provisions of the act in determining whether the rate complained of is reasonable or unreasonable. It will not be questioned, I presume, that the damages recoverable under the provisions of Section 9 are those, and those only, which arise from a violation of some of the requirements of the Interstate Commerce Act. Therefore, when relief by way of damages is sought under the provisions of the Interstate Commerce Act upon the averment that a shipper has been charged an unreasonable rate for goods transported by a railway company, the plaintiff, to become entitled to recovery, must show that the rate charged is unreasonable, according to the provisions of that act. Thus, if the Interstate Commerce Act, construed in its entirety, has recognized, provided for or prescribed a standard for determining whether rates charged by common carriers, subject to the provisions of the act, are reasonable or not, then it cannot be predicated of a rate charged that it is unreasonable, if it appears that it conforms to the recognized or established standard." The court held that, in view of all that Congress intended to compel and to prohibit by such legislation and to give it proper effect, the Interstate Commerce Act must necessarily prescribe a standard "by comparison with which it may be determined whether a given rate is or is not to be deemed unreasonable within the meaning of the act," and that such standard is furnished by the schedules of rates published by each railroad company in conformity with the requirements of the act. The court said:

"It is certainly the intent of Congress to require of the carrier the adoption of a schedule of rates and to make the same public; and it is equally certain that it is the duty of the carrier to charge the schedule of rates, neither more nor less, until a change is made therein according to law. There can, therefore, be no question that Congress has, by this method, provided for the adoption of a fixed schedule, and declared that the carrier must not deviate therefrom, provision being made for changes from time to time, as experience may show that the rates adopted are inequitable, or as changes in the circumstances may justify or demand a readjustment of the schedule charges." The court held that it is, therefore, proper and competent for a carrier sued for damages on the ground that its rate charged is unreasonable, to aver and show that such rate is in accordance with the published schedule.

It was urged that, as the first section of the act declares that rates charged must be reasonable, and, in Section 8, it is declared that the carrier shall be liable in damages to any person injured by its violation of any provisions of the act, the plaintiff should be permitted to show that the schedule rates charged and paid were unreasonable and recover damages for such charges; otherwise, it was contended the provisions of the act authorizing suits and recoveries are meaningless. In regard to this the court said: "If the carrier, after adopting, printing and posting the schedule of rates as required by the act, should charge or exact from a shipper in any form or by any device a rate greater than that fixed in the schedule, an action for damages would be maintainable, and in such case there would be no difficulty in defining the rule of damages, to wit, the difference between the schedule rate and that actually exacted. So also, if the schedule on its face provided for the imposition of unfair and inequitable rates—as for instance, if it should require the payment of a greater charge for the transportation of freight for a shorter than for a longer distance, other things being equal—an action might be maintained, and in that case a rule of damages could be based upon the schedule itself. In the present case, however, the proposition of the plaintiff is that, after the carrier, in obedience to the requirement of the act, has adopted, printed and posted a schedule of rates, and for the past five years has received and transported grain, charging the schedule rates therefor, and the shipper, without protest or demur, has delivered his grain for shipment, knowing the schedule rate, and has paid the charges in conformity with the established rate, he may now, and at any time within the period of the statute of limitations, bring an action at law for damages, not on the ground that more than the schedule rate was exacted, or that the schedule itself provided for unequal and therefore unjust rates, but solely upon the ground that the schedule rates, though uniform and properly proportioned, were greater than they should have been; and thus the question is presented whether the Interstate Commerce Act, considered as a whole, authorizes and provides for an action of this kind. If it can be maintained, it results in the holding that it was the intent of Congress to place upon the courts and juries of the country the duty and burden of establishing the rates of transportation for interstate commerce, and upon the common carriers the burden of transportation, with the right to ultimately retain as pay therefor the rate fixed by the verdict of a jury perhaps five years after the rendition of the service."

It will be perceived that the court discards altogether the idea that an "unreasonable" rate is synonymous with an "extortionate" rate. Nor can it be doubted that Congress clearly realized, when it passed this act, that "extortion," a something always largely mythical, had virtually become obsolete. The court, in this opinion, very pertinently suggests the considerations which should determine the reasonableness of a rate, in the meaning of the Interstate Commerce Act. The language used in the first section of the act, and so frequently quoted, was intended to be general and prefatory. That phrase, viz., "every unjust and unreasonable charge for such service is prohibited and declared unlawful," was meant as a declaration, in general terms, that any charge for railway service should be deemed unlawful, if by means of it any act or practice, defined and prohibited by Sections 2nd, 3rd, 4th, 5th, 6th and 7th should be done or carried into effect. A rate may seem too high, and nevertheless may not induce any consequence meant to be prevented. The Commission itself has often pointed out that very low rates may have that effect, if their reduction to such figures tend to create discriminations. But the rate, to be "unjust and unreasonable," must actually have some effect in inducing or continuing some evil or abuse which the act was intended to correct or avert. Therefore, if a party allege that he has been charged and made to pay a rate unreasonable in that it is a substantial violation of some provision of the act, and recites facts which sustain his averment that the exaction of such a rate amounted to an undue preference or discrimination or to something which the act prohibits, he may and ought to recover. But when he simply alleges that he has been injured and subjected to unreasonable and undue prejudice, disadvantage, etc., by having been charged a rate which is only the rate the carrier has adopted, published and posted, in accordance with the provisions of the act, he must expect the fate of every plaintiff who does not have a cause of action; he surely ought not to recover; and the fact that, in such case, he cannot recover, furnishes no reason why the act should in any respect be amended.

The adoption and publication of these schedules of rates have always been deemed of importance; the Commission has insisted that the railway companies should, in such manner, give the widest publicity to their rates. But no one supposed, at least until Mr. Prouty's friends brought this suit, that one of the purposes of such publication was to furnish material for litigation.

That the case is by no means so far-reaching nor so damaging either to the interests of shippers or

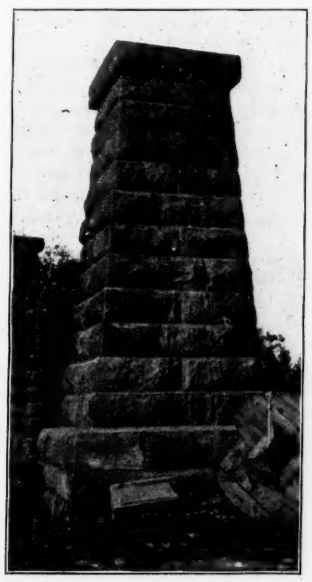
the influence of the Commission, as Mr. Prouty would have us believe, is admitted by the Commission itself in its eleventh report, page 99, when it says:

"It is noted that in no part of the decision is reference made to the power or authority of the Commission to find that tariff rates are unreasonable and order reparation; but that the court was careful to confine its observations to the remedy obtainable before courts and juries in suits at law."

Mr. Prouty insists that because of this decision, and because there sometimes occur, he thinks, certain kinds of discrimination for which damages cannot be recovered, for the reason that they cannot be stated and shown in litigation, "the injustice can in fact only be prevented by laying hold upon the rate itself and correcting that." He thinks the railroads ought not to object to this, because the Cullom bill, which proposes to grant this power, will also authorize the courts to suspend, under certain conditions, its operation. "If the Commission," he says, "after the fullest investigation has determined that the rate made by the carrier is in violation of the act, and has ordered the carrier to bring it into conformity with the act, the railway company may review that order in the Federal courts, and the court may direct that the order shall remain inoperative during the pending of such proceedings."

It has already been suggested that the courts will very reluctantly interfere with the execution of an order of this nature, made by the Commission, in pursuance of an express grant of power; and in view of the language in which this provision of the proposed bill is drawn, it will be perceived that a case will rarely if ever be presented, wherein the courts will find warrant for directing that the order "shall remain inoperative" until the matter is finally decided. This provision is as follows: "The court may also, if upon an inspection of the record it plainly appears that the order proceeds upon some error of law, or is unjust and unreasonable on the facts, and not otherwise, suspend the operation of the order during the pendency of the proceedings in review, or until further order of the court." It is scarcely to be presumed that any error of law will appear; and how can a court possibly determine, by a mere inspection of the record, that the order "is unjust and unreasonable on the facts?" How can a court, in a matter so complex, wherein so many considerations and the facts which illustrate them must be regarded, do so without the most careful and exhaustive examination?

"A freight rate," says Mr. Prouty himself, very justly, "is a peculiar thing, and what seems utterly inconsistent upon the face is often seen to be entirely proper when the facts are developed." The inquiry which will reveal the truth must, however, be something more than a mere "inspection" of a record. The conclusion reached by the Commission, out of which its order has proceeded, may be "unjust and unreasonable," based upon statements of facts upon which it has unduly relied, or which have been successfully controverted by adverse testi-



One Tower of the New Suspension Bridge at Lewiston.

mony; but this will not plainly appear: it can be ascertained only, in the vast majority of cases, by a close and patient study of the record. It is, indeed, the very matter which the court will have ultimately to determine, and when it does "appear," the order should not be suspended but annulled. If this is the best hope afforded the carriers when the Cullom bill shall have passed, they may as well prepare to yield the whole matter of rate-making to the Commission, for every order made will continue in effect until the close of the litigation and the injury done has become irreparable.

The practical reasons why the Interstate Commerce Commission cannot make proper and satisfactory rates have often been indicated. They cannot be in sufficiently close touch with the business; they cannot procure and use promptly the information on which rates are predicated, nor understand so readily as can the railroad officials the conditions of traffic. Moreover, should the Commission attempt it, it would be the effort of one body to do what is now done by an immense number of railroad corporations, provided with all the requisite machinery to competently perform the work. Judge Cooley, when chairman of the Commission, was not willing that its investigations should be so conducted that "the Commission would, in effect, be required to act as rate-makers for all the roads, and compelled to adjust the tariffs so as to meet the exigencies of business, while at the same time endeavoring to protect relative rights and equities of rival carriers and rival localities. This in any considerable state would be an enormous task. In a country so large as ours, and with so vast a mileage of roads, it would be superhuman."

As was said by the Supreme Court in the case which has hereinbefore been cited, the Commission has important functions to perform "in respect to the matter of rates," and which, properly performed, will conduce to make rates both equal and reasonable. But those duties are not of a kind to comport well with the exercise of the rate-making power.

A tribunal which must constantly investigate and often institute complaints, as it is required to do, necessarily becomes to a certain extent partisan, and acquires a temper not exactly the most suitable to the discharge of either judicial or legislative duties. "Railway rates are not made," says Mr. Prouty, "as a young duck swims, by instinct." Very true. Nor should they be made in the manner and spirit in which a Grand Jury finds a true bill.

Mr. Prouty declares that the dispute has reached a point where the question of whether there shall be or shall not be any assertion of governmental control over railroad management, is involved. "The real issue, however," he says, "is regulation or no regulation." The Supreme Court and the Federal courts generally, do not agree with him in this, and are of the opinion that a very proper and competent regulation may be had, under the present provisions of the Interstate Commerce Act, without resort to the heroic methods he advises. But such demands as he and his colleagues are making are well calculated to compel those who are to be subjected to it to revolt against all regulation.

It is not unnatural, certainly not culpable, that railway managers shall desire to retain over the business they are appointed to conduct at least so much control as will enable them to protect the interests committed to their care; that they protest against being deprived of the ability to make the properties they manage yield revenues proportioned to the capital invested.

The regulation, state and national, which has been instituted and threatened; the arbitrary interference with the natural laws of commerce it has involved; the refusal, in some instances, to permit the carriers to recognize legitimate and inevitable competition; the refusal, in others, to permit them to protect themselves against competition, artificial and injurious both to the carriers and the public; the apparent readiness to gratify the wildest popular wish or prejudice at the expense of those who are so unfortunate as to own property in railroads; all this regulation, actual and prospective, has induced some railway managers to seriously doubt whether governmental ownership of railroads, pure and simple, will not be better.

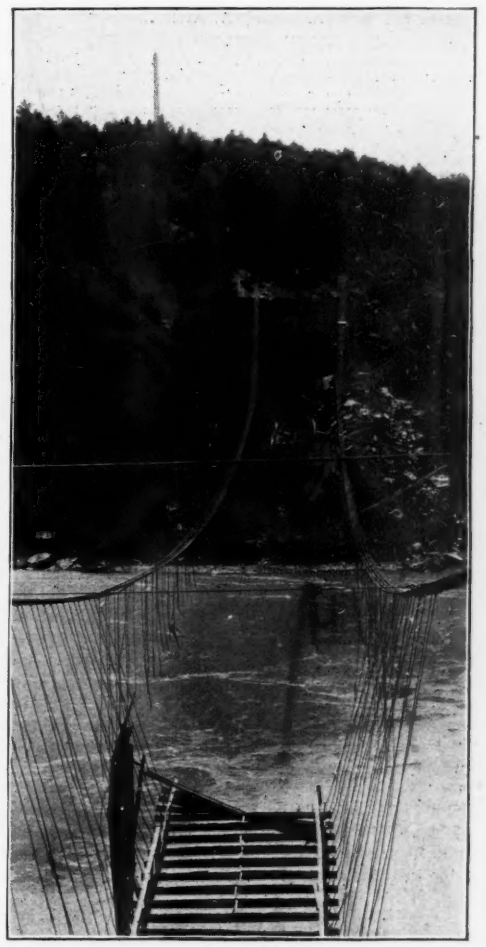
Surely it ought not to greatly surprise anyone that a railroad manager, harassed by the innumerable perplexities this regulation occasions and badgered by the Commission, should sometimes wish that every shipper might "do as he did before he had a railroad, as thousands now do who have not railroads."

The Lewiston Suspension Bridge.

We have mentioned heretofore the building of a suspension bridge across the Niagara River at a point just above Lewiston, N. Y., and Queenston, Ont. This bridge is on the site of the old suspension bridge built in 1851 and 1852, which was destroyed by a gale in February, 1864. Many engineers will remember having seen the cables swinging from the towers any time in the last 34 years. The new bridge is building for the Queenston Heights Bridge Company of Canada and the Lewiston Connecting Bridge Company of New York state. The contractors for the superstructure are the New Jersey Steel & Iron Co., and for the substructure James Stewart & Co. Mr. L. L. Buck is Consulting Engineer and Mr. R. S. Buck is the Chief Engineer. These gentlemen, as is well known, were Chief Engineer and Resident Engineer, respectively, in building the steel arches which have lately replaced the two suspension bridges near the Falls.

This Lewiston bridge is built primarily to carry an electric railroad, which will make it possible to complete a belt line around the Gorge. The principal dimensions of the new bridge are: Span from tower to tower, 1,040 ft.; span of stiffening truss, 800 ft.; width, center to center of trusses, 28 ft.; width of roadway, 25 ft. The bridge will carry a single track for electric cars, with a roadway on either side. No footwalks are provided, inasmuch as there will be very little travel of that sort over the bridge. The flanking span on the New York side will be 34 ft. 6 in. long and that on the Canadian side 19 ft. 6 in. The towers on the New York side are 26 ft. high, and those on the Canadian side 18 ft. On the New York side the towers were placed 28 ft. back from the edge of the bluff, and on the Canadian side 15 ft. Much of the stone of the old towers was used in the foundations of the new ones. The inscription stones in those towers were saved and placed in the new towers.

There will be four cables, each made of 14 2½-in. steel wire ropes. These ropes are from the cables of the upper suspension bridge at Niagara



Wreck of the Old Suspension Bridge at Lewiston.

Falls. These cables were so long that it has been possible to cut them in two and use them for the new bridge, but to get sufficient length about 75 ft. at each end of each cable will be made up of eye-bars. The versed sine of the cables will be 87 ft., and they will be anchored in the solid rock about 150 ft. back from the edge of the bluff.

From the dimensions given above it will be seen that the truss stops 120 ft. short of the tower at either end, and here the traffic will pass from the fixed flanking spans on to the suspended structure. At each of these points a rocker bent is introduced, supported on a shoe below and going up to the cables above. This bent is hinged at the shoe, the end of the truss and the cables. This novel construction will be shown in a later issue.

The clear height of the bridge above high water will be 65 ft. The cables will weigh 200 tons, and about 800 tons of metal will be used in the superstructure. The bridge will be designed to handle the heaviest trolley cars and to carry a uniformly distributed load of 40 lbs. to the sq. foot.

There will be considerable incidental masonry in connection with the work. Face walls have been built along the approaches to save the shale from weathering. On the New York side the face wall is about 19 ft. high at the highest point and runs down to 2 ft. Its length is 800 ft. Other walls will be built on the east end of the New York approach for a distance of 150 ft. and over all these a growth of vines will be encouraged.

It was expected at the time of the last accounts received that the river would be spanned by the first of the wire ropes early in January, and it is thought that the bridge will be completed in March.

Lake Ore and Freight Traffic.

The product of the Lake Superior mines for this year will, according to the Marine Review, amount to fully 14,000,000 gross tons, viz.: 13,650,788 tons shipped by water and probably 500,000 tons shipped by rail. The shipments by water for this year are compared with last year's shipments of 12,215,645, a

gain of 1,435,143 tons, which was about equally distributed among all of the shipping ports except Gladstone, which shows a loss of about 5,000 tons. The receipts at Lake Erie ports aggregate 11,028,321 tons, as against 10,120,906 for 1897. Toledo, Huron, Fairport, Ashtabula and Erie all show slight losses. The ore on Lake Erie docks Dec. 1 was 5,136,407 tons, and at the same date 1897 5,923,755 tons were stored there. It is estimated that there will be less than 2,000,000 tons of iron ore on the Lake Erie docks at the opening of navigation. The vessels passing through the locks at Sault Ste. Marie up to Dec. 1 registered 18,242,014 net tons and carried between 20 and 21 million tons of freight. For 1897 the net registered tonnage was 17,619,933 tons. The principal items of traffic were for the two past years:

	1898.	1897.
Coal, anthracite, net tons	535,043	531,183
" bituminous, " "	3,198,079	2,400,533
Copper, net tons	121,801	118,670
Iron ore, " "	11,592,286	10,569,965
Iron, pig and manufactured, net tons	284,115	134,144
Wheat, bushels	52,481,513	49,847,873
Grain, other than wheat, bushels	24,090,850	19,497,064
Flour, barrels	7,450,289	8,566,657
Passengers	43,354	40,209
	To Dec. 1, 1898.	To Dec. 1, 1897.
Westbound freight of all kinds, net tons	4,383,225	3,175,898
East " " " " " " "	16,284,108	14,609,573

The Review gives the following average daily freight rates for the season of 1898, and the same rates for the 10 years ending with the season of 1898, viz.:

	1898. Cents	10 years. Cents
Iron ore Escanaba to Ohio ports, gross ton	50.8	67.
" " head of Lake Superior to Ohio ports, gross ton	61.0	94.
" " Marquette to Ohio ports, gross ton.	59.8	83.
Soft coal, Ohio ports to Milwaukee, net ton	27.8	48.
" " " " " Duluth, " "	23.4	38.
Hard coal, Buffalo to Chicago, " "	28.	47.5
" " " " Duluth, " "	23.	31.
Wheat, Chicago to Buffalo, bushel	1.5	2.
" Duluth " " "	1.8	

The development of the Lake Superior traffic since the opening of the deeper lock in 1883 has been marked, even as an instance of American development. The first locks with a depth of 11½ ft. on the mitre sills were opened in 1855 to a traffic of 106,296 net registered tons. When what was for some time termed the new lock was opened in 1883 with 16 ft. on the mitre sills the traffic had only increased to 2,042,259 tons; this year 18,242,014 tons passed through the locks, an increase of very nearly 800 per cent. for the 15 years. The record of the Suez Canal has been very different. Opened late in the year 1869, in 1883 it had a traffic of 5,775,862 net registered tons, but has never had a traffic of 9,000,000 tons. The average rate charged on all freight between Lake Superior and the lower lakes for the season of 1897 was .83 mills per ton mile. This is slightly more than 10 per cent. of the average railroad freight rates in this country.

The Framing of Cars.

We printed last week a considerable part of the paper by Mr. F. M. Whyte on "The Framing of Cars." Abstracts from the discussion of that paper by the Western Railway Club follow:

Prof. W. K. Hatt: The possibility of carrying part of the weight of the car and its loading to act nearer the center of the body bolster must be admitted. As Mr. Whyte has just remarked, an intermediate sill, which is made stiffer than the other sills, will carry a relatively larger proportion of the load, in accordance with the general principle that when two or more members transmit loading to a support the different members take amounts of the load in proportion to their respective stiffness. Nor does the use of truss rods change the matter.

The effect on the other parts of the car structure, of stiffening the intermediate sill, is not touched upon by Mr. Whyte. But whatever may be the distribution of the load on the bolster, and no matter how this distribution may be effected, it is necessary to determine the deflection of the bolster at the side bearing.

The problem of computing the deflection of a beam is simple enough when the flanges of the beam are parallel. When the flanges run together at the end, as indeed they do in some forms of bolster, or when the depth of the bolster decreases from the center to some depth less than the center depth at the end, the problem is somewhat complex. As Mr. Whyte remarks, no formula exists to fit the latter case.

The speaker has developed a formula to fit this latter case, and has applied it to a number of forms of bolster. He has also made tests of a few forms of metal bolster in the laboratory of Purdue University. It may be remarked that the results of tests agree with the results of computation from the formula.

Tests: A metal body bolster tested with a loading equivalent to 80,000 lbs., uniformly distributed, had a deflection of ⅛ in. at the side bearing.

A metal truck bolster of 75 in. span deflected ⅛ in. under a center load of 80,000 lbs. Another metal truck bolster of 55 in. span deflected $\frac{3}{32}$ in. under 80,000 lbs. center load.

Some years ago the Master Car Builders' Association instituted tests on wooden truck bolsters. Under a load of 25,000 lbs. these bolsters deflected from 0.2 to 0.4 in. in a span of 54 in. One trussed bolster, of span 75 in., deflected 0.12 in.; and one bolster which had been in service two years deflected 1.4 in. The latter deflection was probably due to looseness of parts.

Computation: Passing to metal truck bolsters resting on springs, computation of deflection in case of six selected bolsters results in a deflection of about $\frac{1}{10}$ in. under 80,000 lbs. load.

Again, three rigid truck bolsters (center depth 12 in.) showed a deflection of $\frac{1}{16}$ in. in a length of 75 in. under a center load of 80,000 lbs. Two others (center depth about 16½ in.) under the same conditions had a deflection of $\frac{1}{32}$ in. In the case of these rigid truck bolsters the partial fixity of the ends was neglected in computation.

Again, a body bolster designed for a 100,000 lb. car had a computed deflection of $\frac{1}{1000}$ in. under a load of 80,000 lbs. The truck bolster for the same car had a computed deflection of $\frac{3}{32}$ in.

It must be remarked that all these computed deflections are elastic deflections due to bending. They need to be increased to account for inelastic deflection—i. e., that due to looseness of parts. In the case of bolsters with web plates there will be a slight additional deflection due to shear, probably not more than one-quarter part.

The elastic limit of the truck bolsters corresponds to a center load of from 100,000 lbs. to 160,000 lbs. The range of center depth is from 10 to 13½ in. in case of bolsters resting on springs; and from 12 to 17¼ in. in case of rigid truck bolsters.

The elastic limit of the two body bolsters examined corresponds to a uniformly distributed load of 60,000 lbs. Taking the live load effect as double that of the dead load, it would seem that these body bolsters do not possess reserve strength to the same degree as do the truck bolsters. The difficulty is, of course, to obtain a sufficiently stiff bolster with the limited depth at the command of the designer.

It is evidently true in the case of bolsters, as it is true in case of brake beams, that the strength and stiffness of structures designed for identical service seem to be dependent on the judgment of the designer rather than on any rational or formal process of computation.

In the Journal of the Franklin Institute for September, 1898, will be found a formula, developed by Prof. I. P. Church to fit the case of a truck bolster composed of an upper compression member and a lower tension member.

Mr. James W. Hill (Peoria & Pekin Union): For some time I have been doing away with king posts entirely on the needle beams, and have been putting in deep needle beams, using a small iron saddle to carry the body truss rods on the lower face of these beams. This I consider a better construction for any class of cars, and particularly so for gondola cars, as it permits a long bearing for two very heavy stakes on each side of the car, thus preventing the bulging out of the sides of the car when heavily loaded. It also prevents the turning out of the side sills where a rod is carried through the sills from one side of the car to the other, just below the floor near these large stakes. On passenger cars where four body truss rods are used it is also very important to have very stiff needle beams to prevent the two center rods from humping the floor up in the center. In my opinion, it is a good plan to truss these needle beams on passenger cars over the top edge, to prevent the tendency to spring up in the center.

Mr. A. M. Waitt (Lake Shore & Michigan Southern): I am satisfied that if it is possible and practical to have a body bolster which is stiff enough to carry the load so that it can be transmitted to the truck at the center plate, that undoubtedly is the ideal and proper way to carry it; but last week I had occasion to spend two days or so cruising around in the various railroad yards in the vicinity of Pittsburgh to see, among other things, what had been accomplished in the way of making body bolsters for steel cars. I looked over a great many cars, the number running up into the hundreds, cars of 80,000 lbs. capacity and some of 100,000 lbs. capacity, and in no style of construction was I able to find an average of more than five cars out of ten where the body bolsters under load were stiff enough to keep the side bearings apart. It has been assumed, I think quite generally, that with these heavy steel cars this object has been accomplished. In some cases the side bearings were clear, and others on cars of the same construction were down. It was claimed by the manufacturers, and I think truly borne out by the facts, that the sagging was due to weakness in the center plate, and the support directly above the center plate, and not due to general weakness of the body bolster, and that by filling in under the center plate with the casting, so that the bearing was transmitted through solid metal to the top of the sills, the trouble of sagging will be entirely avoided. The latest designs of steel cars have body bolsters and metal enough and proper distribution, so as to make them absolutely rigid under 110,000 lb. loads.

But we know that it is practically impossible to always trim a load perfectly even. The load will be more on one side than on the other, and consequently the side bearings will be in contact on one side. In going around a curve the centrifugal force will throw the side bearings in contact on the outside of the curve. So that I think it is going to be necessary, even though we have an ideally stiff body bolster, to provide some help against friction when the cars are on a curve or when the load is unevenly distributed. I think it is theoretically and practically true that, in designing a car, either of wood or of steel, as much of the load as possible should be distributed along the central line connecting the supports. That would be distributing the load as far as possible to the center sills. In order to do that, it would seem necessary to give a great deal more attention to the needle beams, or cross-tie timbers, as we speak of them in the Master Car Builders' Dictionary, than has been given in the past. With the steel car construction I think the tendency is to have very heavy and deep center sills. It is not always practicable to have them so stiff in the wooden construction, and especially where the capacity of cars is being raised from 60,000 lbs. to 80,000 and 100,000 lbs. capacity. In the past, when we had light loads, the design of a car was not a matter that called for so much careful consideration and design as at present, and I believe we have got to come to the position of giving a scientific and theoretical consideration to car designing as we have never done; by doing so, we will have the greatest carrying capacity with the least amount of material used.

Mr. G. W. Showers (Canda Cattle Car Co.): I had occasion to make an experiment a short time ago. Our cars have the weight exclusively upon the side bearings, allowing 8 in. from outer truss rod to the end of the body bolster. The truss rod was 3½ in. from the inside of the side sill. I have found these cars after running six or eight months with the body bolster, which is wooden, 5x14 in., down almost ¾ in. I made a change in these cars by taking the truss rod from the space between the intermediate sill and side sill, and placing it nearer the intermediate sill and nearer the center of the car, and those cars on which I made the change, with the same size needle beam, have not gone down a particle; that much in favor of truss rods being nearer the center plates.

The Uganda Railroad.

The latest information is that the railroad building from Mombasa toward the Victoria Nyanza has now advanced 235 miles from the sea. The total length, as determined by the surveys of Capt. MacDonald, R. E., whose report we published at considerable length some years ago, is 657 miles, although it is said that it is hoped to make a considerable saving on this by a revised location.

The work has been done under great difficulty, but 96 miles have been laid in the last seven months. The line has now reached an altitude of 4,000 ft. above the sea, and a better climate than in the country nearer the coast. So far the water has been very bad, the only good boiler water having been found in one river. The tsetse fly has killed off the animals at a great rate. Out of 550 bullocks imported from India only 100 were alive last June, and 50 mules out of 150 died in two months. The rainfall was 40 in. in two months, and there was a great deal of sickness, as many as 10 per cent. of the laborers having been in the hospital at one time. The lions have also been troublesome, 22 men and four bullocks having been carried off.

The latest account of the enterprise says that the traffic in ivory on the line now opened is "already considerable," which is a pretty vague statement. We suppose that nobody expects this line to pay as a commercial enterprise, at least for two or three generations. In fact, MacDonald estimated a loss of $350,000 a year. But as a political, strategical and philanthropic enterprise it is a grand undertaking, and if the people of the British Empire are willing to embark in such undertakings no one else should object.

Failure of the Gas Tank in New York.

On Tuesday of last week a large gas tank recently built for the Consolidated Gas Company of New York failed, resulting in the complete destruction of the tank and some injury to the surrounding property, besides causing the death of six persons. The retaining tank was 178 ft. in diameter and was made up of steel sheets, each from 4 to 5 ft. in width, about 30 ft. in length and varying in thickness from an inch and a half at the bottom of the tank to ⅜ of an inch at the top. This steel cylinder extended 25 ft. above the surface of the ground and 17 ft. below. Metal buttresses were used to stiffen the retaining tank and a lattice girder was at the top. The holder, 174 ft. in diameter, was made up of four concentric cylindrical sections, and when extended to its full height the top was nearly 165 ft. from the bottom of the retaining tank.

The tank had just been completed and was being tested. Considerable water had been put in the retaining tank when, without any warning, the retaining tank gave way. The shell of that tank was

torn vertically in several places, but in every part examined there was no evidence of a failure along the line of the rivets. In one of the lower sheets in the retaining tank about 60 rivets were sheared off, but the metal showed no fracture along the line of the rivet holes. Rivets which were cut off near this seam after the failure were all shown to be of first-class material. It was the exception, however, to find a breaking of the rivets.

The tank was made by the Logan Iron Works. Greenpoint, Brooklyn, and President H. E. Gawtry of the Consolidated Gas Co. states that the tank had not yet been accepted, so that the loss will probably fall on the Logan company. It would be useless now to speculate on the probable cause of the failure; it is hoped, however, that the investigation which is proposed, will be sufficiently thorough to lead to some definite conclusion.

In some places the shell of the tank was torn open vertically for many feet. A $\frac{13}{16}$ in. plate on the west side was torn vertically for nearly its entire length, but no rivets were torn out or was the plate otherwise disturbed. The main part of the shell of the retaining tank is in place on the west and south sides, but near the northeast side the destruction of the tank was complete, resembling much the effects of an explosion, although it is known no explosion occurred.

Measurements taken on the plates of the retaining tank are given in the table which follows. The first sheet noted in the table was the lowest one in the tank.

Plates of Retaining Tank.

Thickness, inches.	Width, inches.	Rivet Holes, inches.	Pitch of Rivets, inches.
1½	49	1¼	5
1⅜	49	1⅛	5
1⅜	49	1⅛	5
1 11/16	52	1⅜	4¾
15/16	52	1¼	4¾
13/16	51	1¼	4¾
⅞	57	1⅛	4
½	57	1	3¾
7/16	57½	⅝	3½
⅜	63	¾	3

Some Notes on Light Railroads.*

Three somewhat distinct but timely and important topics will be considered, viz., (1) street railroad costs, (2) compressed air traction, and (3) rapid acceleration. Some phases of these have been given undue prominence, while a few essential considerations have been ignored.

Street Railroad Costs.

The working expenses of the lines of the Metropolitan Street Railway Co. of New York City, which were recently printed, have attracted widespread attention. The question has been raised, If the New York roads can save from six to seven cents over cable and horse traction for each mile run, by the installation of the electric conduit, why should not other large cities profit by a similar change? Our reply to this is that both the horse and cable are doomed, but the latter will seldom be displaced by electricity because of an estimated decrease in the working expenses. This may be opposed to the generally accepted notion, but is believed to be well founded. Below is given a comparison of New York and Chicago roads for the year ending June 30, 1898. The figures for the Metropolitan Street Railway Co. of New York came from President Vreeland, and those for the Chicago City Railway Co. have just been received from President Bowen, of the Chicago road. On this latter road engines and boilers have been in place for 20 years, the motors and equipment for five years, the passenger cars have run for 10 years, the present tracks were laid 10 years ago and have cast welded joints. The approximate depreciation is 10 per cent.

Working Costs of New York and Chicago Roads.

Cost per car mile in cents for year ending June 30 1898.

	New York. Conduit Electric.	New York. Cable.	Chicago. Trolley.	Chicago. Cable.
Transportation	6.15	7.78	5.934	4.567
Maintenance of way†	.33	3.54	1.482	1.278
Power	1.70	2.02	1.082	1.151
General expenses	1.22	2.07	2.593	2.594
Maintenance of equipment	.83	.94	1.960	1.116
Total per car mile	10.23	16.35	13.051	10.706

Miles run:	New York.	Chicago.
Cable	11,991,000	12,562,610
Electric	7,110,000	24,378,000
Horse	15,995,000	198,860

In these figures the item "maintenance of way" is of special interest. Observe that the cost for this item in New York was about 10 times the amount in the cable as in the electric, while in Chicago they differ but little. The New York roads being new and having the wires in the conduit accounts for the low cost for maintenance in that city. It is well to note further that this item for the cable roads is nearly three times as much in New York as it is in Chicago. It may not be advisable to attempt an explanation of this any more than to tell why the transportation item for the cable roads should be nearly twice as large in New York. We cannot satisfactorily explain either. The power item for the different roads averages 12 per cent. of the total working costs, the highest being 16 per cent. for the conduit electric (N. Y.), and the lowest 8 per cent. for the Chicago trolley roads. Suppose therefore 10 per cent. is saved in the coal pile, it makes a saving of say 1 per cent. in the total operating expenses. This condition is sometimes overlooked. In a list of 19 roads in Connecticut, each of which carried over 1,000,000 passengers during 1895, the average working cost per car mile was found to be 13.83 cents, and the average amount for the motive power item to be 2.56 cents, or 19 per cent. of the total.

It should not be assumed, however, that companies can afford to be wasteful of power, or that they should be satisfied with present results. Mr. Conant's paper before the last meeting of the American Street Railway Association showed that 44 representative power stations in this country, with an aggregate capacity of 131,800 elec. h. p., and incurring an annual expense to run of $1,825,000, could save $443,000 if the power had been produced by all at as low a figure as it was in a number of the more economical stations. These figures may lead to some notion of the amount of capital invested in street railroads. A more definite idea, however, can be formed from the statement that were the capital liabilities (funded debt and capital stock) of the street railroads in the United States divided equally among the seventy millions of population, every person would have a share amounting to $21.10 in the 15,700 miles of track which had been built to November, 1897. Possibly a better way to state this would be to say that for each mile of surface road the capital liabilities average $94,100.

Returning to the topic of the relative cost for different kinds of motive power: A study of the following may prove of interest. In order to make fair comparisons only roads of considerable mileage have been selected. A cable with light traffic is seldom a paying investment; on the other hand, it seems reasonable to suppose that there is such a thing as overloading a cable road, resulting in high working costs.

Working Costs per Car Mile.

	'96.	'97.
West Chicago Street Railroad Co.:		
Cable	13.88	15.42
Electric	10.69	10.85
Horse	20.77	16.15
North Chicago Street Railroad Co.:		
Cable	13.	13.40
Electric	12.50	11.40
Horse	22.	20.6
Nat onal Railway Co. of Chicago (St. Louis):		
(a) Cable	5.78	6.10
Passengers per car mile	(2.02)	(1.98)
(b) Electric	8 28	8.18
Passenger per car mile	(2 80)	(2.77)
Cost of carrying each passenger:		
(a) Cable	3.98	.....
(b) Electric	4.29	.....

The St. Louis figures are so much below the others that it was thought probable that some items usually included in making up the totals per car mile had been omitted for the roads in that city. Even with this uncertainty, they will do for purposes of comparison. These are not selected figures, but are believed to be representative, and we simply call attention to them, comment being unnecessary.

It may be well to here note what is going on in one or two places abroad. In the hilly city of Edinburg two years ago the cable was introduced, and when the plans are carried out 38½ miles of single track will be worked by cable. The cost per car mile, including every charge except interest on capital and depreciation is said to be 5.2 pence. Adding interest and sinking fund we get 7.671 pence per car mile. The receipts have been 10.13d. = 2.458d. net profit.

About three years ago, Newcastle, England, practically decided to adopt cable traction, but the matter was shelved and the question of motive power has since hung fire. In September last estimates prepared by Mr. W. N. Colam and the late Dr. John Hopkinson on the cost of installing and working cable and electric tramways were considered by the Town Council of Newcastle. Although the estimates which were prepared by the experts (Mr. Colam for cable and Dr. Hopkinson for trolley) were made on somewhat different assumptions, yet a comparison of the lump sums given should not be misleading. For the cable the estimated cost per mile (for a road having 40 miles of track) was $56,500, and the total working costs per car mile run, 6.688 cents. For the electric road of the same length Dr. Hopkinson figured the cost per mile would be $44,850, and the working expenses per car mile run, 9.4 cents.

These figures and considerations lead to the belief that while New York City can afford the underground trolley, costing from thirty to one hundred and fifty thousand dollars for each mile of track, other cities now using the cable could not change with profit. Furthermore, it is unreasonable to expect that roads now using the overhead trolley will change to electric conduit, except where forced by legislation. The conduit electric is superior for many reasons to the cable and the trolley, but our figures show that the cost of working the cars by the three methods (trolley, conduit electric and cable) should not vary widely. There are demands of the people which must be satisfied, and the question of cost should be subordinate to these.

Compressed Air Traction.

This subject is of especial interest, inasmuch as a large sum of money is being spent for equipment and cars for the 28th and 29th street lines, New York City, and further it may not be generally known that the Hardie locomotive, which proved unsuccessful on the elevated railroad about a year ago, is being remodeled and will doubtless be given a trial on the Putnam Division of the New York Central early next year. Mr. Joseph Leiter's financial interest in the development as shown by negotiations for the purchase of the Rhode Island Locomotive Works, primarily for the purpose of pushing the foreign sales of the Hoadley-Knight motors, will probably have far-reaching effect—especially on the stock market. In addition to these attempts, the city engineers of Tokio, Japan, have recommended that compressed air traction be adopted for the streets of that city. Whether electrical engineers can change the trend of the event in these enterprises remains to be seen.

In 1881 this motive power was used in a small way in New York City, but until the last two or three years the storage pressure, and consequently the limited amount of air possible to store for a run without recharging has probably been the chief drawback to renewed attempts. These early trials were made by Mr. Robert Hardie, and his motors contained some of the distinctive features of the Makarski system, the special one of which, as introduced on the two-mile line at Berne, Switzerland, was in the method of heating the air by passing it through hot water before permitting it to enter the working cylinders. Trials which were made by heating the air by this method, and also by warming the air in pipes by means of heat applied externally, showed that better results were obtained when the air was passed through water than by "dry" heating. Some have held the theory that air passing through hot water become saturated with moisture, carrying particles of water into the working cylinders of the motor. This, however, is an assumption and nothing more.

The pressure in the storage reservoirs on the cars at Berne is 440 lbs. per sq. in. Tests made in 1891 showed that the maximum consumption of air for a car mile was 42 lbs., the minimum 28. These figures agree fairly well with the results recently obtained by the motors in New York. The working of the Makarski motor at Nantes and Vincennes has been reviewed at some length by Prof. Jacobus in a paper presented at the New York meeting of the American Institute of Mining Engineers, September, 1890.

The successful experiments with air at high storage pressures revived many of the old theories and at the same time renewed the confidence of investors. The latest and most successful attempts have been made under the direction of Messrs. Joseph Hoadley and Walter H. Knight. Under their direction, many tests have been made on storage bottles, the results of four of these being here made public for the first time. Even if the results had no direct bearing on the extended application of compressed air for railroads, they would still be of sufficient importance to prove of great interest to engineers. Heretofore tests on Mannesmann and other bottles in which the pressures were carried to 5,000 or 6,000 lbs. have been criticised by engineers because hydrostatic pressure alone was used and naturally the tubes or bottles did not fly to pieces. We have here, however, tests 3 and 4, made under air pressure, with results that speak for themselves.

The tubes from which these bottles were made passed through the following stages: Special nickel steel ingots made at the Carnegie Steel Works were sent to the Erhardt Works in Germany, where they were punched into a tube by the same process as followed in making all their bottles for high pressures. They were then sent to this country in what is here termed the "untreated state," and tests 1 and 3 show how they behaved under the different pressures. Some of the flasks, however, that had been made by precisely the same process, and having the same quality of steel as those just referred to, were given a special treatment similar to the Harveyizing process. Results of tests on two of these "treated" bottles are given in tests 2 and 4. A test not recorded here shows that one of the bottles withstood a pressure of 13,000 lbs. per sq. in. before it gave way, when it burst by ripping the shell in a manner similar to the treated bottle in test 4. A number of the better makes of bottles were tested, and every one flew to pieces when they burst. The tests were made at Harlem, New York City and at Worcester, Mass. The bottles to be broken were placed about 500 ft. from the compressor and air was forced into them through a ½-in. extra heavy copper pipe. When the air compressor had forced the pressure to the limit of the machine an hydraulic pump was connected and worked until the bottle burst.

Other tests were carried out in which air was forced to about 2,400 lbs., after which the air was exhausted, and this process of filling and exhausting was repeated so as to meet the conditions of a service test

(*Continued on page 918.*)

*From an address delivered Dec. 2, 1898, by Mr. Arthur J. Wood, before the Stevens Engineering Society, Stevens Institute of Technology, Hoboken, N. J.

†The Chicago figures for this item include also the costs for the maintenance of buildings.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

When the block system is adopted on a railroad in the wilds of Oklahoma, as we are told it is going to be by the Atchison, the most conservative must admit that it is becoming popular. It is not a new thing for the space interval method of moving trains to be used on roads of very thin traffic; indeed, its use a dozen years ago by the Canadian Pacific, which has some of the thinnest lines in the world, marked the beginning of the popularity of this method on single track railroads in America; but its extension to new deserts after these years of testing affords strong evidence that the merits of the plan are not imaginary. It may be, indeed, that the Atchison has found the space interval valuable as an advertisement, and so has decided to use it without regard to whether there shall be a positive diminution in the collision account. Certainly, on the railroads of Oklahoma and Indian Territory collisions ought not to be frequent under any method, for trains are too few. But the adoption of the plan as an advertisement is legitimate, for the argument that collisions are less likely to happen than under the time interval is one that passengers can comprehend; and if a passenger agent can make his customers feel safe he has made a good point. This will hold good even in spite of minor defects in the argument, if the passenger agent's position is in the main sound. A time-interval road, well managed, might show better results for a given period than one poorly managed, but using the space interval; but reason still would be on the side of the space interval.

The Midland Railway of England, one of the great roads running northward from London to Carlisle, has long been known to Americans as one of the most enterprising of the English railroads. The Midland led for years in changes in passenger classification, in rates and in experiments with motive power and rolling stock. Whether or not the spirit of enterprise has anything to do with the fact that this English railroad has just placed an order for 20 locomotives in the United States we cannot say. The press dispatches say that the order came to this side of the water because the English shops were crowded, and the Baldwin Locomotive Works inform us that they have undertaken to ship their part of the order within 60 days, or about the middle of February. We have not learned what time the Schenectady Works have asked for the locomotives that they are to build. The order is for 20 engines, 10 of which are to be built by the Baldwins and 10 by the Schenectady Works, all to have 18 in. x 24 in. cylinders, 62-in. drivers and to weigh, in working order, 92,000 lbs. Promptness and willingness to take trouble to fill hurry orders has had a good deal to do with our locomotive invasion of foreign markets. When the Director of the Soudan Military Railway suddenly called for four passenger engines the British shops, which were building for him 12 goods locomotives, declined to promise to deliver the passenger engines in less than 13 months. The Baldwins contracted by cable for delivery within 90 days, and later undertook to make the delivery within 60 days, as we remember, possibly in less time. So the Baldwin Works took their part in the reconquest of the Soudan.

The Atchison, Topeka & Santa Fe has a large number of semaphore signals made to give the caution indication by showing the arm inclined upward from the horizontal position. These signals, with other features of the block system on that road, are described in another column of this issue. The upward movement affords a solution of the difficulty which arises where it is found desirable to use two-position and three-position semaphores on the same road or division, and it is an easier solution than any other that has been offered. If no objections develop in practice, there would seem to be no fundamental obstacle to making the change from the present general practice, except that based on sentiment. Downward 45 degrees has been so long cherished as the ideal for the caution indication that it is hard to break with the tradition. But in practice the all-clear position, which ought to be "vertical or nearly vertical," has taken possession of the 45-degree and all other angles below the horizontal, and the attempt to maintain two separate downward positions, as is the practice on the Pennsylvania Lines West of Pittsburg, meets with constant difficulty—the difficulty that enginemen must, at different signals, interpret the same position (or very nearly the same) to mean different things. The upward inclination has been in constant use on the Erie west of Salamanca for seven years, with entire satisfaction. It is also mentioned favorably in a suggestive paper on signalling recently read at Boston by Mr. E. K. Turner, and reported in the Railroad Gazette last week. Mr. Turner's views are evidently founded on experience and study. He points out another feature of caution signalling which needs attention—the inconsistency of having a horizontal arm mean at one place "stop" and at another "caution." In the matter of the distant signal, the English may be said to be more consistent than we are, for they make no attempt to differentiate the distant from the home; we make the attempt, but do not carry it far. By accepting Mr. Turner's suggestion we may have stop, all-clear and caution indications at the home or starting signal, and caution or all-clear at the distant, and all of these consistent with each other and non-conflicting. And this suggestion deserves attention, whether we do or do not adopt the upward inclination of the arm.

The Computation of the Deflection of Body and Truck Bolsters.

Recently we have had occasion to call attention to the frequent lack of scientific method in the computation of the deflection of body and truck bolsters and to the consequence that these parts have often been imperfectly developed by the cut and try method. Coming at a time when much interest is being taken in this subject, the methods for computing the elastic deflection of bolsters, as given in this issue by Prof. Hatt, are important, and we would strongly recommend that all those interested in car design should familiarize themselves especially with the graphical method for determining deflections, as the same process is applicable to many problems involving difficult integrations.

Those who read this article carefully will be impressed by the thorough manner in which the subject has been treated and the simplicity of the final expressions which are deduced and recommended as approximate working formulæ. For the benefit of those who may not have time to read this article carefully it may be well to say that the body bolster is first considered and an algebraic expression derived for the curve into which such a bolster will be bent under an assumed uniform loading. The moment of inertia of the various sections is also taken to vary directly as the distance of each section from the end of the bolster. It is subsequently shown that the error introduced by these assumptions is unimportant, but the expression derived in this way is rather too cumbersome for everyday use, and therefore the equation, $\frac{1}{15}\frac{w\,l^4}{E\,I'}$, will probably be found sufficiently accurate for the deflection at the side bearings of body bolsters of the web and flange type, about 106 in. long and with side bearings placed about 30 in. from the center.

A graphical method for obtaining the elastic deflection of similar body bolsters is next explained, and it should be noted that the advantage of this method over the analytic method is that any arrangement of loads can be considered, and the true values of the moment of inertia of the various sections can be used. The integration in this case may be performed either by a planimeter or by adding up small increments of area, so that a knowledge of the integral calculus is not essential.

The arithmetical process, next described, involves the same principles as the graphical method, the quantities being tabulated instead of plotted; the graphical presentation, however, is to be preferred, as errors in the work can be more readily detected. The algebraic expression derived for the elastic deflection of truck bolsters will probably not be found so useful as that applying to body bolsters, as it is conceded that metal truck bolsters are as a rule made sufficiently stiff, and their design is not at this time a matter of so much concern.

As to the testing of body bolsters for deflection, attention is called to the methods used by Prof. Hatt to check the results of his computations. The bolster was placed in a testing machine and the equivalent loads were successively applied at points corresponding to the centers of the sills. First the loads near the ends were applied and the resulting deflection at the side bearings was measured; then loads were applied in turn at points corresponding to the centers of the intermediate sills and center sills, the side bearing deflection being measured in each trial. Thus, if there were center and side sills and two intermediate sills, there would be four separate applications and four deflection measurements at the side bearings, whose sum would equal the deflection at the side bearings if all the loads acted together. This is allowable from the fact that within the elastic limit the combined effect of a number of loads acting together is equal to the sum of their separate effects. It is scarcely necessary to add that this is more rational and is to be preferred to the usual method in which body bolsters are tested. Simply applying loads at the center of a body bolster which is supported either at the ends or at the side bearings, gives a result that in no way signifies what will be the deflection under a loading corresponding more nearly to the conditions of service. A modification of the usual method of conducting tests of body bolsters would seem to be highly desirable.

It is also important to note the remarks as to the computations, not taking into account inelastic deflections due to looseness of parts, and the importance of making allowance for such inelastic deflections where bolsters are built up of many parts riveted together. As the computation of the deflection of bolsters has now been simplified and put in convenient shape for the use of designers, it is to be expected that the stiffness of bolsters will not be so troublesome a problem in the future.

The Nicaragua and Panama Canals.

Just about six years ago, namely, in January, 1893, we began a discussion on the Nicaragua Canal project with a certain very definite purpose. That purpose was to prevent the people of the United States from being committed financially, legally and morally to a colossal and immature scheme concerning which they had only very superficial information, and that information entirely ex parte. Our purpose was accomplished. How far we were responsible for stopping the scheme at that time we cannot even estimate; but we are proud to believe that our share in the good work was important.

At that time the statements of the Maritime Canal Company and of the advocates of the Nicaragua Canal were taken almost without question by the press of the United States and by the great body of Senators and Representatives in Congress. A bill was in Congress to make the Government of the United States guarantee the bonds of the Canal Company for a hundred million dollars. The estimates of the company were that it would cost about $65,000,000, but a board of engineers, whom the company had called upon to examine plans and estimates, had raised the cost to about $88,000,000. Our contention was that nobody in the world knew enough about the conditions to make an estimate, and our suggestion was that the President should be directed to send an independent board of competent engineers to study the country and to report before any further action was taken. The detailed facts which we presented as to what was not known about the enterprise immediately changed the course of opinion among the judicious and really public-spirited members in both houses of Congress, and in a very large part of the daily press. The result was that the Ludlow Commission was sent to Nicaragua, and it reported that perhaps the canal would cost $133,000,000, but that no one could know very precisely what it would cost without much further

study, and, finally, as everybody knows, the whole matter has dragged along until to-day.

Now conditions have changed suddenly as a result of the war with Spain, and of our acquisition of territory in the Pacific Ocean. There is to-day a strong probability that a Nicaragua Canal bill of some sort will be passed during this session; but it is not at all certain that the United States Government will take up the building of the canal itself or guarantee the bonds of a private company without precise and definite treaty arrangements with England and other powers. Meanwhile, it may be as well to consider the Nicaragua Canal enterprise in its possible relations to the Panama Canal.

Upon the tremendous collapse of the De Lesseps schemes, it became necessary for the French Government to protect the interests of the shareholders by appointing a liquidator. This officer was a man of integrity and determination. Some of those who had become rich in fraudulently manipulating the canal matters were thrown into prison by him and others were threatened with imprisonment. He formed a basis for a new canal company and assigned to the guilty parties various amounts of shares, which they were compelled to subscribe for at par or be further prosecuted. Thus he raised about 75,000,000 francs, and with this amount in bank he put a force on the Isthmus by cable, got a renewal of the concession from the Colombian Government, put the property in good condition, and sent to Panama a force of experienced engineers, some of whom were government engineers of large experience and high standing. He gave instructions to them to make a thorough examination and detailed surveys of all of the physical conditions, topographical, hydrographical and hydraulic. They were specially instructed to examine carefully all of the conditions relating to the principal obstacles in the way of building the canal, namely, the assumed treacherous materials in the Culebra cut, and the also assumed uncontrollable torrents in the Chagres River. The former were fully examined by tunnels and test pits. The upper valley of the Chagres was surveyed in great detail to the headwaters of all of its tributaries, so that it was possible not only to make a complete contour map of the entire country of this great water-shed, but also to ascertain the rainfall, and to gauge the streams which sent their waters into the main trunk of the Chagres River.

On the completion of all of this work, requiring several years, the conditions were carefully studied at Paris by the engineers of the company, who then made the plans for the work. These were then submitted to an International Commission of experienced and distinguished engineers. It may be said that this commission is composed of the best men to be found in the world; they have all had very extensive experience in the kind of work that would have to be done at Panama, and they are men of the highest character. This commission has given careful study to all of the questions involved, has modified the plans submitted, where necessary, and has been able to establish feasible plans and to make an estimate of the further cost of the work.

During these several years of engineering work the new company has, with good judgment, great carefulness and much skill, employed a considerable force on actual work which would be within the line of any plan which might be finally approved. A force of from 1,000 to 4,000 employes, with suitable machinery, has been steadily at work. There is now a good navigable channel 16 miles long from the port of Colon, and six miles long from the deep water of the Pacific Ocean at Panama. There are no difficult harbor conditions, and the channel which was dredged in Panama Bay by De Lesseps has remained intact up to the present time.

As to the two projects now before the country, namely, Nicaragua and Panama, it would be unwise to decide in advance of the report of the Board of Engineers which has recently examined the Nicaragua route. But when that report is made, why would it not be well to refer both reports, that of the United States Board upon Nicaragua and that of the International Board upon Panama, to an international commission, the appointment of which should be authorized by Congress and the appointments made by the President? Then let the company in whose favor the commission decides go on with its work, supported by the good will of the United States and of the other maritime powers of the world; the United States and the other powers to enter into a convention to maintain the neutrality of the canal in peace or war; to establish a zone of approach by drawing an arc of a circle, with, say, a 20-mile radius, making a sector of a circle within which no vessel, merchant or naval, is to be molested by the ships of any nation; in the area outside of that zone of refuge the ships of all nations to look out for themselves; this convention to confer upon the United States of North America, on account of its paramount national interest in the maintenance of the channel, the necessary police powers, which, by the way, it already has at Panama under its treaty with the United States of Colombia, and which powers it has already exercised at various times when internal disturbances have required the strong arm of a nation greater than Colombia to maintain the integrity of the transit way.

In saying this, we are aware of the difficulty there always is in opposing sentiment, and the sentiment of the people of the United States is now strong, and its purpose determined, to establish a transit way across the American Isthmus for the passage of its warships and to unite its two separate coast lines. It should, however, be borne in mind that other sovereign peoples have also now separate coast lines—Mexico, which has such natural obstacles to its railroad connections between the coast lines, by reason of its lofty table land and range of mountains near its western coast, that up to the present it has not been able to make a transcontinental line except in the extreme lower limits of its territory, at the Tehuantepec Isthmus; the Dominion of Canada, with immense coast lines upon the east and west, and with only one long and expensive railroad line connecting them; most of the States of Central America, Guatemala, Honduras, Nicaragua and Costa Rica, so that only at Panama and Tehuantepec have the coast lines of these countries been connected by rail even, to say nothing of ship canals. Then, again, the countries of South America need a water connection for their mutual intercourse, and all the countries of the world need this same connection, all have commercial interests, more or less important, which would be subserved by a maritime canal.

As to the project of the United States fortifying the Nicaragua Canal for its exclusive military benefit, let us assume for a moment that we can obtain by consent of the two republics interested the right to do this, and also, what we ought to have, the approval of the other maritime powers of the world. Have we reckoned upon the difficulty and cost of protecting the integrity of a ship canal as long as the distance from New York to Baltimore in a country far removed from our base of operations? Have we considered the possibility that in the case of war with one or more countries of the world the locks, or other parts of the canal, might be blown up or interfered with, and that a fleet of combined naval powers might make the approaches to this canal impossible to our warships? Would not these dangers send the Oregon again around Cape Horn to assure her safety by having a free ocean in which to manœuvre? Would not a neutral canal, made so by treaty with all the maritime powers of the world, be much better for our people?

Would it not, therefore, be advisable as a prudent people to first wait for the complete report of the present Board of Engineers, and then to select an international commission to compare the two routes in question and all the plans and data and make a report to the President, and then ask the maritime powers of the world to unite with us in making the chosen route truly international and absolutely neutral? Would not the interests, both commercial and industrial, of our own country, and those of mankind in general, be thus best subserved?

Russian Fares and Trains and the Siberian Railroad.

On the 15th of October last began the trips of a "fast" train between Moscow and Krasnojarsk, the eastern terminus of the part of the Siberian Railroad fully opened to traffic. This train runs only once a week, being dispatched from either terminus every Saturday evening. The distance between the two places is 2,717 miles, and the running time is fixed at 144 hours and 6 minutes, so that the average speed of this "fast" train is 18⅞ miles per hour. But the ordinary trains require 178 to 188 hours for the trip (15¼ and 14½ miles an hour); so that the passenger by the fast train saves 34 to 44 hours, for which he pays an addition of $5.50 to the price of a first-class ticket, and $3.30 to that of a second-class one. This train has no third-class cars. The regular fare is but $27 first-class for this long journey, which is but 500 miles less than the shortest rail distance from New York to San Francisco or Puget Sound. This, however, is common to very long journeys under the present Russian passenger tariff; though there is no route in the Empire nearly so long which does not include part of the Siberian Railroad. Thus the first-class fare from Moscow to Krasnojarsk by this special train is only $32.50. The speed seems extremely moderate for an express, but it is, we think, fully as great as that of trains between Omaha and San Francisco for several years after the Union and Central Pacific were first opened. The moderation of the speed on the Russian route, however, can hardly be charged wholly to the imperfections of the newly constructed Siberian Railroad, for a little more than half of it is in European Russia, west of the Siberian road.

When preliminary studies were made as a basis for the Russian passenger tariff, which was introduced four years ago (December, 1894), it appeared that only a very small proportion of the passengers made journeys of any considerable length. More than 50 per cent. of the journeys were for 33 miles or less; only 6 per cent. for more than 200 miles, and only 2 per cent. for more than 400 miles. When we remember that the distance from St. Petersburg to Moscow, the two great cities of Russia, is 400 miles, this seems remarkable. It was concluded that at existing fares very few Russians could afford to make long journeys, and that a very great reduction in fares for long distances could be made without danger at least, since the receipts for such distances were almost a negligible quantity.

It further appeared that only 1 per cent. of the passengers traveled first-class, and only 6 per cent. second-class, while 93 per cent. took third-class tickets.

In making the new tariff, these considerations led to making the rates for long distances lower in proportion than for shorter distances. The old tariff for the third class was left unchanged for distances of 160 versts (106 miles) or less; for greater distances up to 300 versts (200 miles) 0.9 kopek per verst (0.7 cent per mile) was added for each verst above 160. For distances greater than 300 versts a zone tariff was made, with 8 zones of 25 versts each between 300 and 500, 7 zones of 30 versts between 500 and 710, 8 zones of 35 versts between 710 and 990, 13 zones of 40 versts between 990 and 1,510, and 50 verst zones for all distances above 1,510 versts. For each of these zones a charge of 20 kopeks (10 cents) was fixed.

The fare for the second class was made 1½ times and that for the first class 2½ times the third-class fare.

The old (and the new) third-class fare for 160 versts was 2 rubles and 30 kopeks=$1.18 for 106 miles. From this and the above data all fares for distances above 160 versts can be calculated.

To show the extreme effect of this tariff, we apply it below for the distance from New York to San Francisco, 3,270 miles, equal to 5,614 Russian versts. For the third class this would be made up of:

	Rubles.	Kopeks.
First 160 versts	2	30
Next 140 versts at 0.9 kopek per verst	1	26
8 zones from 300 to 500 versts	..	..
7 " " 500 to 710 "	..	..
8 " " 710 to 990 "	..	..
13 " " 990 to 1,510 "	..	..
83 " " 1,510 to 5,614 "	..	..
119 zones in all at 20 kopeks per zone	23	80
Total	27	36

This mutiplied by 1½ gives 41.04 rubles as the second-class fare, and multiplied by 2½ gives 68.40 rubles as the first-class fare, or, reduced to our currency at 51½ cents per ruble, $14.09, $21.14 and $35.23 for the three classes respectively for this enormous distance. Yet, for the first 1,510 versts (1,000 miles) the fares are $5.25, $7.88 and $13.13; so that the passenger is carried the additional 2,270 miles for $8.84, $13.26 and $22.10, according to the class. All this, be it remembered, under a tariff which makes the first-class fare for 106 miles $2.95.

Only on one line in the Empire is a journey of this distance possible, and that must include the whole of the finished portion of the Siberian Railroad; and special efforts were deemed justifiable to secure the settlement of Siberia and the movement of the laborers required in building its railroad. But the fares for 1,000 miles, as shown above, are very low, even for the first class; and even for 200 miles they are but about 2¼ cents per mile first class, and less than 1 cent third class.

Russia, since the beginning of the Siberian Railroad enterprise, attracts more attention than formerly to its transportation system, which, to a certain extent, is likely soon to compete with older routes, mostly by sea, but also, doubtless, with American lines between the Atlantic and the Pacific. The English drummer soliciting business in Japan may take the route overland to his field of operations, instead of crossing the two great seas and North America, or circumnavigating Southern Asia. Now the practicability of this will not depend on the Siberian Railroad alone, whose performance as a through line is yet to be tested; for the western terminus of the Siberian Railroad is 3,200 miles from London, and of this distance no less than 2,225 miles is in European Russia—a field heretofore little known to Western European travelers. To the Russian border the facilities are those familiar to us. The passenger by the quickest route can reach the border at Alexandrowo in about 29 hours from London, the distance being very little greater than that between New York and Chicago, and including nearly four hours at sea between Dover and Ostend. But from Alexandrowo eastward, whatever may be said

for the accommodations of special trains, the speed is different. The passenger leaving the border at 3:53 a. m. does not arrive at Moscow, 950 miles, until 2:45 p. m. of the second day—is 35 hours on the road; and the only other train takes 48¾ hours for the trip. The quicker train makes about the time of the Chicago-New York trains at the time of the opening of the Pacific Railroad, the average speed being 27 miles an hour. From Moscow to Cheljabinsk (spelled Tscheljabinsk in the German transliteration, often followed in English) the time by the special fast train (only first-class) is 65 hours, the distance 1,370 miles; the average speed 21 miles an hour. The other two passenger trains between Moscow and Cheljabinsk, by a little different (but shorter) route, are 84 and 82 hours on the road. The special's speed is something like that of the lines between Chicago and Omaha in the early days of the Pacific Railroad. Thus, to go from London to the border of Siberia requires 129 hours..

But what the Russian railroads lack in speed they make up in cheapness, at least for long routes. Our passenger from London to Siberia must pay $34.70 for his first-class ticket to the Russian border, 975 miles; from the border to Moscow, 950 miles, only $17.86; and from the border to Cheljabinsk, the Asiatic frontier, 2,225 miles, if he makes it without breaking his journey, he will pay only $23.28, with some addition, perhaps $3, if he takes the special train, by which he will save something like 24 hours, but which runs only once a week, and till recently ran only twice a month.

It may be suggested, however, that the great mass of travelers, commercial travelers at least, are likely to go not into the wilderness of Siberia, but to the populous districts of European Russia, which has cities like St. Petersburg, with 1,267,000 inhabitants, Moscow with 989,000, Warsaw with 615,000, Odessa with 405,000, Lodz with 315,000, Riga with 283,000, and Kiev with 249,000—cities which are growing about as fast as our own. It is the communications from the border to these cities, and between the cities, which determine the rank of the Russian passenger service.

The chief entrances into Russia from the west are at the border towns Wisballen (German side Eydtkuhnen) to St. Petersburg and also to Moscow, and at Alexandrowo (German side Thorn) to Warsaw, Moscow and Kiev; to Odessa and Kiev, through Austrian Poland by Cracow and Lemberg.

Now from Berlin to St. Petersburg the distance is 866 miles, and there are three trains daily, going in 34, 35 and 37 hours respectively, and a train twice a week in 30 hours. On the Russian side, 550 miles, the fast special train runs 33 miles an hour; a train with a sleeping car 29 miles, another 30½ miles, another train only 19 miles (28½ hours on the road), and another (twice a week) 21 miles.

Between Warsaw and St. Petersburg, 693 miles, there are three through trains daily, besides the special train once a week between St. Petersburg and Nice. This latter runs 31 miles an hour; the others 22 and 29 miles.

Between the two great cities of Russia, St. Petersburg and Moscow, the distance is just 400 miles. There are seven through trains daily, all with sleeping cars. Two, both night trains, may be called fast, making the trip in 12 h. 10 m. and 13 h. 15 m., or 33 and 30 miles an hour. The other five trains take 17, 18, 18¾, 20 and 20⅜ hours for the 400 miles respectively. In the other direction there is a train which leaves Moscow at 9 a. m. and arrives at St. Petersburg at 10 p. m., and this is the nearest approach to getting over the road by daylight. The new line from Moscow to Archangel, 695 miles, has but one through train daily in 37½ hours, going north, and 39½ in the other direction, which is not bad for an Arctic road.

From Moscow to Kiev, 628 miles, three trains go at the rate of 18⅛ 22 and 25½ miles an hour.

Out of Odessa, the Chicago of the Black Sea, northwestward, towards Austrian Poland and Berlin, the fastest of four trains makes 31 miles an hour; another 29; the others 17¾ and 17. Westward to the Rumanian line the speeds are 12 and 15¾ miles an hour; northeastward towards Charkov, 14½ and 22½ miles an hour.

The Transcaucasian Railroad, between the Black Sea and the Caspian, which is as yet unconnected with other Russian railroads, and separated from them by the mighty range of the Caucasus, has a mail train which passes over the 559 miles from sea to sea in 33 hours, and another train in 28⅜ hours.

It appears from this that the Russian railroads are comparable in speed with our Southern railroads shortly after the war, rather than with any considerable American lines at present. Not that slow trains are unknown in this country still. A little search in the Official Guide will find several which run less than 20 miles an hour, and we find one which consumes 4½ hours in going 26½ miles, and its receivers do not advertise it as a mule railroad either. However, our slow trains are nearly all unimportant routes; while the Russian trains we have cited are nearly all on important lines out of leading cities.

It would seem, then, that when the Siberian Railroad is completed to the Pacific, with the speed of the special fast train, it will take more than 13 days to go from London to Port Arthur, on the Pacific. The speed east of Moscow is just about that of ocean steamers; but the distance is less by land than by sea, and the future Governor General of the Philippine Islands will doubtless be able to get from New York to Manila by way of Europe and the Siberian Railroad in less time than by any other route—in less time than a steamer can sail from San Francisco to Manila. And if the present Russian passenger tariff is maintained, it may well be the cheapest route. We have found the fare of our first-class passenger from London to this end of the Siberian Railroad to be $58.08; for the additional 4,000 miles to the Pacific by this tariff is only $31 more—less than $90 from London to the China Sea, which is not half the fare by ocean steamers through the Suez Canal, though the cost of subsistence and sleeping cars by rail would probably add $50 or more to the cost of the journey. This fare, however, would require an average train-load of about 200 to yield $1.50 per train-mile. It is not probable that the cost on the Siberian Railroad can be less than that, nor that trains of sleeping cars (absolutely necessary for so long a journey) carrying so many can be hauled. But if Russia maintains the rate, the Siberian Railroad can probably secure pretty much all the travel between Europe on the one hand, and China, Japan and Australia on the other, even with the slow trains. With the speed of our Pacific railroads (which cannot be called great) the time over the Russian section of the journey would be reduced from 12 to 9½ days, and over the Siberian Railroad alone from 8 to 5½ days; but a different railroad from the one now building will be required for that; though it doubtless can be transformed, as the Union and Central Pacific have been in the 30 years since they were opened.

New Railroad Building in the United States, Canada and Mexico.

If new railroad building is an index of improving industrial conditions, then the year 1898 will stand as the most prosperous since the panic of 1893. Preliminary reports show that the railroad building of this country for the past 12 months is not less than 2,867 miles. It is probable, however, that later reports will somewhat enlarge this mileage, but as it stands it shows the largest increase of new railroads since 1892, when the nation's roads were increased by 4,419 miles. Last year we added but 2,188 miles, and in 1896 2,112 miles. The lowest mileage of recent years was in 1895, when we added only 1,603 miles.

Of this 2,867 miles of increase this year more than one-third was supplied by nine roads. The company which stands first is the Great Northern, with 165 miles, most of which was built between Duluth and Fosstown, Minn. The St. Louis & San Francisco stands next, with 142 miles, of which 103 miles forms a connecting link between Sapulpa, Ind. Ter., and Oklahoma City, Okla. The Mobile & Ohio has built 128 miles, completing its extension to Montgomery, Ala., and building several branches. The Washington County road comes next, with 118 miles, all in Maine and along the coast. Then follows the Pecos Valley & Northwestern, with 106 miles; which is about one-half the length of this proposed connecting line between Roswell, N. M., and Amarillo, Tex. The El Paso & Northeastern has built 100 miles of track. Other roads which have added mileage of importance are the Minneapolis, St. Paul & Sault Ste. Marie, 78 miles; the Southern Pacific, several branches aggregating 73 miles; the Shreveport & Red River Valley, 63 miles; San Francisco & San Joaquin Valley, 60; Kansas City, Pittsburgh & Gulf, and the Gila Valley, Globe & Northern, each 57; the Northern Pacific, four branches aggregating 56 miles; the Choctaw, Oklahoma & Gulf, 53, and the Kansas, Oklahoma Central & Southwestern, 51 miles.

In the distribution of mileage by states Minnesota takes the lead, with 253 miles; then follow Texas, with 188 miles; Louisiana, 171; Alabama, 161; Oklahoma, 157; Arkansas, 140; Maine, 123; California, 115; Missouri, 111; Michigan and Georgia, each 104. It is an interesting fact that four of the states have more than one-fourth of the new mileage, while it required 33 states and territories to make up another fourth of the increase. One-half of the 2,867 miles was in nine states and territories.

A characteristic of the railroad building of 1898 is that it has not been confined to any one section of the country. On the whole the South and West have built the largest mileage, and yet the old state of Maine has added 123 miles to its railroads, and New York state 64 miles. The Mississippi Valley, although already apparently well supplied with roads, has received large increments in nearly every section. Marked as has been the improvement in new mileage during the past year, if present indications count for anything the aggregates for the coming year may be expected to be even larger. For, with the roads already under construction, and with the new projects arising so rapidly that it is almost impossible to chronicle them, the year 1899 opens more promising in the field of new railroad building than any year of recent times.

The figures so far received for Canada and Mexico indicate similar prosperity. Ten roads in Canada have built 448 miles, which is more by some 53 miles than that reported last year. Of this mileage more than one-half, 262 miles, is credited to the Canadian Pacific, whose Crow's Nest Pass extension alone added 217 miles to its totals. Ten roads in Mexico have built 412 miles, which is nearly 100 more than the totals of last year. Below are given figures in detail for the United States, Canada and Mexico, by states and territories:

NEW RAILROADS BUILDING IN 1898.

	Lines.	Mileage.		Lines.	Mileage.
Alabama	6	161.23	Nebraska	1	3.5
Alaska	1	20.	New Jersey	1	.24
Arizona	3	88.3	New Mexico	2	90.1
Arkansas	9	140.1	New York	8	64.46
California	5	115.68	North Carolina	7	92.65
Colorado	5	33.1	North Dakota	1	77.5
Delaware	1	1.5	Ohio	6	55.2
Florida	5	59.	Oklahoma Ter.	4	157.
Georgia	9	104.33	Oregon	3	59.55
Idaho	1	21.	Pennsylvania	17	53.44
Illinois	4	8.5	South Carolina	2	16.
Indiana	1	11.	South Dakota	1	11.
Indian Territory.	5	81.75	Tennessee	1	8.
Iowa	3	42.	Texas	14	188.83
Kansas	1	51.	Utah	1	38.
Kentucky	1	.4	Virginia	4	51.
Louisiana	7	171.17	Washington	4	19.7
Maine	3	123.31	West Virginia	5	30.5
Maryland	1	10.	Wisconsin	5	51.
Michigan	8	104.	Wyoming	1	6.3
Minnesota	7	253.3	United States	167	2,867.14
Mississippi	4	41.5	Canada	10	448.25
Missouri	5	111.5	Mexico	10	412.
Montana	2	39.5			

Vice is a monster—and railroads have been guilty of various kinds of it; but it has remained for a company down in Texas to "unblushingly" try to improve the condition of its property without borrowing money. Among the bloated bondholders of New York and Boston a railroad which "ploughs in" a part of its income is looked upon with favor, but in Texas such conduct appears to be a statutory offense. At any rate the Railroad Commissioners of the State, according to the St. Louis Globe-Democrat, have just issued, in their annual report, the following statement:

"Some of the railroad companies are frank enough to state the cost of permanent improvements which they have included with and charged to operating expenses. There is scarcely a doubt that a still greater number of companies hide expenditures for permanent improvements and betterments in their operating expense account. In fact we know of one instance in which the entire cost of changing the gage of a railroad from 3 ft. to 4 ft. 8½ in. was unblushingly charged up to operating expenses."

Texas would seem to be a good field for those English investors who want a dividend paid within 15 minutes after it is earned. Commissioner Reagan and his associates would doubtless afford them every possible facility for making sure that the General Manager did not use any of the company's earnings to provide against a rainy day.

Some Notes on Light Railroads.

(*Continued from page* 915.)

on a car covering a number of years. In no case was it found that a permanent set occurred or that the metal was fatigued when thus tested.

Test 1.—Report of bottle burst by hydrostatic pressure.
Name.—No. 9 Carnegie, untreated. Date, Aug. 9, 1897.
Weight of empty bottle, 270 lbs. Capacity, 2.776 cu. ft.
Length, 9 ft. 11 in.
Average gage of bottle before testing, 8 1/16 in.

Pressure. Lbs. sq. in.	Displacement. Cu. in.	Remarks.
500	1	
1,000	1¾	
1,500	3½	
2,000	4½	
2,500	5	
3,000	6¼	
3,500	7¼	
4,000	8¼	
4,500	9	
5,000	10¼	Released pressure and found no set.
5,500	12½-13	Released pressure, found 2 oz. set.
6,500	..	Bottle burst.

Test 2.—Report of bottle burst by hydrostatic pressure.
Name.—No. 11 Carnegie, treated. Date, July 24, 1897. Weight of empty bottle, 267½ lbs. Capacity, 2.776 cu. ft. Length, 9 ft. 10½ in. Thickness at thinnest part of rupture, .280 in. Average gage before testing, 8 in.

Pressure.	Displacement.	Remarks.
500	1	
1,000	2	
1,500	3¼	
2,000	4½	
2,500	5¾	
3,000	7¼	
3,500	8½	
4,000	10	
4,500	11¼	
5,000	13	Released pressure and found 1¼ oz.
5,500	14¼	
6,000	16	
6,500	18	
7,000	20	
7,500	22	
8,000	24	Released pressure and found 4 oz. set.
11,500		Bottle burst.
		Bottle calipered every 2 ft. Shows: close end 8; 2 ft. up 8 1/16; 4 ft. up 8 1/16; 6 ft. up 8 1/16; 8 ft. up 8 1/16. At end of rupture 8 1/16.

Test 3.—Report of bottle burst hydro-pneumatically.
Name.—No. 10 Carnegie, untreated. Aug 10, 1897
Weight of empty bottle, 267½ lbs. Capacity, 2.784 cu. ft.

Pressure.	Displacement.	Remarks.
500	¾	
1,000	1½	
1,500	3¼	
2,000	4½	
2,500	5¾	
3,000	7	
3,500	8¼	
4,000	9¼	
4,500	10½	
5,000	13-14	Released pressure and found 3 oz. set.
6,800	..	Bottle burst.

After releasing at 500 lbs. pressure the bottle was placed in a trench and covered with heavy bags. It was charged with air to 2,500 lbs., which was then increased to the bursting pres-

sure by an hydraulic pump. The bottle burst as shown in sketch. After the explosion the bottle remained in one piece, no part having been broken off.

Untreated Bottle.—Burst by Air at 6,800 Lbs. per sq in.

Test 4.—Report of bottle burst hydro-pneumatically.
Name—No. 13 Carnegie, treated. Date, Aug. 9-19, 1897.
Weight of empty bottle, 268 lbs. Capacity, 2.785 cu. ft.
Estimated total displacement before rupture, 22.4 cu. ft.

Pressure.	Displacement.	Remarks.
500	1	
1,000	2	
1,500	3½	
2,000	4¾	
2,500	5¾	
3,000	7¼	
3,500	8	
4,000	9	
4,500	10⅛	
5,000	12	
5,500	13¼	
6,000	15	Released pressure and found 1¼ oz. set.
6,500	17	
7,000	18½	
7,500	20½	Released pressure and found 3 oz. set.
11,500		Bottle burst.

Aug. 12.

After released pressure at 7,500 lbs. the bottle was placed in a trench in the same way as bottle No. 10. It was charged to 2,500 lbs. with air, and then water was added until pressure was 9,500 lbs. The pressure would not rise above this, although the pump was kept runninz. It being evident that there was a leak somewhere the bottle was brought back and remeasured. It was found to have taken a set of 8 ozs. only.

Aug. 19.

After necessary repairs were made the bottle was again placed in the trench and charged with air to 2,400 lbs. and water to 11,590 lbs., when it burst.

Treated Bottle.—Burst by Air at 11,500 Lbs. per sq in.

The mention of these very high pressures may cause some to feel uneasy for fear risks will be taken which might not result in bursting the bottles, but some connection or valve might give way and do much injury. It is well to recognize this source of danger, but at the same time bear in mind that no air compressor has been built to work at greater pressures than about 2,500 lbs. per sq. in., and it is doubtful if higher pressures than this will be attempted. The 1,000 h. p. Ingersoll-Sargent compressor which will be used at 28th street for the Metropolitan Street Railway Company will be a four stage machine compressing to 2,400 lbs., and will be placed in a vertical position, the top to be 60 ft from the ground.

[Diagrams thrown on the screen showed the course taken by the air from the time it left the storage reservoirs until it was exhausted at the low pressure cylinders of a Hoadley-Knight motor. Some of the theoretical and practical advantages of reheating and the amount of work done, due both to warming the air and also to the injected water, were considered. These questions were discussed in our issue of Dec. 1, 1897, so that a repetition here is unnecessary.]

From strictly a mechanical point of view, what claims, if any, has this power to recognition among engineers? A few comparative figures are here presented for your consideration. Considering first an electric road with heavy service and frequent stops, we have the following approximation:

Coal per hour, H. P. at stationary engine	.3 lbs.
Loss in engine	10 per cent.
Loss in dynamos	10 " "
Loss in line and connections	10 " "
Loss in motors such as would be used in widely varying work	40 " "
Final efficiency, 90x90x90x60, equals nearly	44 " "

Pounds of coal and air in stationary engine to get one useful h. p. on drawbar of electric motor equals 3 ÷ 4.4 or 6.8, which is not far from the figure for the pounds of coal per h. p. per hour for a steam locomotive burning a medium quality of coal.

We cannot with perfect confidence make an estimate for the different losses in compressed air traction. The best that can be done is to take the result of tests. It was determined that 35 per cent. of the indicated power of the compressor was available at the rim of the wheels. Under the steady running of a compressor, a horse-power hour can be produced on 1¾ lbs. of anthracite pea coal. Taking 10 per cent. loss in the engine and 35 for the loss from compressor to the cars, as given above, it follows that 5.5 lbs. of coal per hour per h. p. would be required at the boiler to give a horse-power at the track, exclusive of the estimate for reheating, which is taken as one-fifth of the power absorbed in compressing the air, adding 1.1 lbs. + 5.5 lbs. = 6.6 lbs. to give one effective horse-power at the tracks.

These figures show that, as far as useful h. p. is concerned, working under restricted conditions, electricity, steam and compressed air are rivals—no one showing a marked advantage in the power available at the drawbar. Bear in mind, however, that this is simply an approximation which may be of use in making an accurate estimate when all the special conditions and the requirements of service are known with certainty.

[To be Continued.]

TECHNICAL.

Manufacturing and Business.

The Michigan-Peninsular Car Co. has declared a dividend of 2 per cent. on the preferred stock, payable Dec. 21.

The Long Car Heating Co. of New York has been incorporated to make and sell heaters for cars, carriages and other vehicles. The capital subscribed is $215,000, with a privilege of increasing to $300,000. The shares are held by John A. Long, S. E. Ostrom, N. H. Esler, Frederick Wierman, Lew H. Ginter and C. W. Long.

The New York Auto-Truck Co. of New York has been incorporated for the purpose of buying inventions pertaining to machinery and apparatus for producing power. The capital stock is $500, with a privilege of increasing it to $1,000,000. The shares are held by Geo. E. Bonchin, Jos. H. Hoadley, Anna M. Franklin, Harry E. Knight and Walter H. Knight.

The Westinghouse Air Brake Co. has declared a quarterly dividend of 2½ per cent. and an extra dividend of 2½, payable Jan. 10.

The Westinghouse Electric & Mfg. Co. has declared a quarterly dividend of 1¾ per cent. on the preferred stock, payable Jan. 3.

A. L. Whipple has resigned his position with the Boston Woven Hose & Rubber Co. to become Sales Agent for the E. T. Burrowes Co. of Portland, Me., makers of car curtains and car curtain fixtures for steam and street railroads.

The Lake Shore & Michigan Southern has specified the "machined" special wheel of the New York Car Wheel Works for the tenders and engine trucks of the 15 engines just ordered from the Brooks Locomotive Works. The tender wheels are to be 36 in. in diameter, and the truck wheels 33 in., the latter being of the spoke pattern. This grade of wheel was specified by the road as a result of the service received from wheels furnished by the New York Car Wheel Works for 30 locomotives built in 1895. A considerable number of these wheels are still in service, and the works state that those recently removed show mileages of over 130,000 miles.

Press dispatches state that application for a charter has been made by William Hamilton, J. C. Knoll, F. A. Mizener, W. J. Sands and T. A. Lamb, incorporating the Erie Car Works.

The New York office of the Detroit Graphite Mfg. Co., in the Home Life Building, was destroyed by the recent fire in that building, and the company has opened a new office in the St. James Building, 1133 Broadway.

The Q & C Co. has been awarded a gold medal for Servis tie plates by the Trans-Mississippi and International Exposition, held at Omaha.

The No. 9 Hancock composite inspirator, made by the Hancock Inspirator Co., Boston, Mass., is being used on the 20 heavy locomotives which the Brooks Locomotive Works are building for the Buffalo, Rochester & Pittsburgh; on the 15 freight engines ordered by the Boston & Albany from the Schenectady Locomotive Works; and on five Illinois Central switching engines.

The Michigan-Peninsular Car Co. has ordered 2,000 Security lock brackets from the Chicago Grain Door Co., for use on Wisconsin Central box cars.

The Baldwin Locomotive Works are rebuilding their frame shop, making a two-story building 102x 169 ft. This will be of iron encased with brick, and will cost about $35,000. The second floor will be of I-beam construction, having brick arches and a clay floor. The machine tools will be on the first floor and forge fires on the second. The contractors are Macey, Henderson & Co.

The stockholders of the Standard Railroad Signal Co. have elected Mr. Henry Burden, of New York, 2d Vice-President, and Mr. Eugene Seitz, of Troy, Treasurer, to fill the vacancies caused by the resignation of Henry Johnson.

Mr. Chas. E. Webster, whose resignation as Chief Engineer of the Lehigh Valley was noticed Dec. 9, has opened an office in South Bethlehem, Pa., as consulting engineer. Mr. Webster will make large construction a specialty, and will devote his attention to work of examination and arbitration.

J. S. Mundy, Newark, N. J., reports a number of recent shipments of hoisting engines, etc., among which are the following: Carload of hoisting engines to Chicago, carload of hoisting engines to Portland, Ore., a pile-driving engine, derrick and hammer to Mexico, a hoisting engine to Cuba, two 60-ft. pile-driving engines with 4,000-lb. hammers, double cylinders, double drums, 30 h.p., and boilers complete for the Government at the Brooklyn Navy Yard. Among recent orders may be mentioned one from the Missouri Pacific for a double-cylinder, double-drum hoisting engine with special boiler to be mounted on a pile-driving car. There is building at the works a 38,000-lb. hoisting engine for the Merritt-Chapman Derrick & Wrecking Co., to be put on a combined lighter and wrecker.

McCord & Co. reports that nearly 40,000 McCord journal boxes were specified during the month of November. Some are: Lake Shore & Michigan Southern, 1,000 cars; Chicago, Burlington & Quincy, 1,200 cars; Armour Car Lines, 1,200 cars; Boston & Albany, 300 cars; Chicago & West Michigan, 100 cars; Kansas City, Beaumont & Gulf, 300 cars.

J. C. Munn, Secretary of the Pittsburgh Bridge Co., has been elected Secretary and General Manager of that company. L. J. Affelder, Jun. A. S. C. E., has been appointed Principal Assistant Engineer, that place having been made vacant by the resignation of H. H. Rosseau, recently appointed Civil Engineer U. S. Navy.

New Stations and Shops.

It is stated that the Great Northern will build a new grain elevator in West Superior, with a capacity of 3,000,000 bushels.

Iron and Steel.

The London Daily Mail for Dec. 2 states that the Carnegie Steel Co. has secured an order for 40,000 tons of rails for the Cape Colonies at 15 shillings a ton under English tenders.

As has been expected, John W. Gates resigned the Presidency of the Illinois Steel Co. at a special meeting of the Directors held in New York Dec. 14. The resignation takes effect Dec. 31.

Tin Plate Consolidation.

The American Tin Plate Company has been incorporated in New Jersey, with a capital of $50,000,000, of which $20,000,000 is 7 per cent. cumulative preferred stock and $30,000,000 is common stock. The incorporators are James B. Dill, Howard K. Wood and Duncan T. McLaren, of East Orange. The list of the mills owned by the new company covers all the mills in the United States, we should suppose.

Tie Plate Patents.

We published last week an illustrated description of a new tie plate made by the Q & C and the Railroad Supply companies, known as the Q & W tie plate. Messrs. Dilworth, Porter & Co. have brought out a new tie plate on something the same lines, called the Glendon longitudinal flange tie plate, which we shall describe shortly and which embodies some of the essential features of the Q & W. The Railroad Supply Company and the Q & C Company have sent a circular letter to railroad officers saying "that an interference has been declared by the United States Patent Office between the above-named patent [being the Glendon patent issued to William Goldie, Sept. 6.] and an application filed by Benjamin Wolhaupter about a year prior to the filing of the application on which the Goldie patent issues. If the decision should be in favor of Benjamin Wolhaupter a patent will issue to him, and in such event all Glendon plates manufactured and used either prior to or after the issuing of the Wolhaupter patent will be infringements thereon."

Gatling's Steel Cast Gun.

Last Thursday the first official tests were made of Dr. Gatling's big cast steel gun, General Miles and other members of the Ordnance and Fortifications Board being present. The firing was at the Sandy Hook proving grounds. This gun is a matter of great interest, inasmuch as it is an effort on the part of Dr. Gatling to make a steel cast gun which shall have such qualities as will permit it to take the place of built-up or wire wound guns. This particular gun is 8 in. caliber and was cast in a vertical position, muzzle down, the steel entering the mould with a swirling motion, the purpose being to give something like a fibrous condition of the metal around the bore. A very heavy sink head was used to secure compactness of the material. A preliminary bore was made and then the casting was heated and cooled from the interior. In the tests five rounds were fired, the greatest pressure, with a charge of 142 lbs. of brown powder, being about 37,000 lbs. per sq. in. Three hundred rounds will now be fired, to determine not only the endurance of the gun, but its accuracy.

Railroad Work in Havana.

We gave last week, page 895, a little account of the present work and plans of the American Indies Company in and about Havana. From later information we learn that the company has a contract from the United States Government for a wharf at Trisconia, in harbor of Havana; also a contract for a railroad from Trisconia to Matancas, being a branch of the United Railroads of Cuba. The road is 7½ miles long. The American Indies Co. are the contractors, of which R. A. C. Smith is the President. Office 100 Broadway, New York. The work is now under contract and there is 750 men at work on the same. The Chief Engineer of the road is J. U. Crawford. The rails and rolling stock are already ordered.

The Union and the National Signal Companies. The consolidation of the National Switch & Signal Company, of Easton, with the Union Switch & Signal Company, of Swissvale, Pa., was briefly announced in the Railroad Gazette of October 7, page 728. The stockholders of the Union Company met in Pittsburg last week and ratified the action of the Directors in their decision to issue $500,000 general mortgage bonds for the purpose of raising funds to purchase the entire capital stock of the National Company. At the same time the stockholders voted to increase the number of directors from five to seven

and the two additional places on the board were filled by the election of Robert Pitcairn, of Pittsburg, and Oakleigh Thorne, of New York. Mr. Thorne, who is President of the National Company, was elected First Vice-President of the Union, and Mr. E. H. Goodman was elected Second Vice-President.

The engineering departments of the two companies will be practically consolidated and all bids for contracts will be made from Swissvale. The shops at Easton will, however, be kept up. Aside from what is here stated, the personnel of both companies will remain unchanged. The purpose of all of the changes which have been made in connection with the consolidation has been to reduce expenses. There is no intention to raise prices, and it is hoped that the savings made may even warrant a reduction in the prices of material and work furnished by both companies.

THE SCRAP HEAP.

Notes.

The Louisville & Nashville announces that the ramaining 5 per cent. of the cut in wages made in August, 1893, will be restored to the employees of the road on Jan. 1.

Near Batavia, N. Y., on Dec. 13, eight men shoveling snow from the tracks of the New York Central were struck by a fast passenger train and killed. Four other men were injured.

The anti-scalping bill was brought up in the Senate this week by Senator Cullom, but the Senate would not then consider it, and it is said that it will now have to go over until after the holidays.

A suit to compel the American Express Company to pay the war revenue tax on bills of lading has been tried before the Supreme Court of Michigan and the court has unanimously decided in favor of the plaintiff; the express company must pay the tax.

The Southern Pacific has decided to put on a night passenger train between San Francisco and Los Angeles to run through, each way, 480 miles, in about 14 hours, or at the rate of 34 miles an hour. At present the daily train takes about 23 hours, and the Sunset Limited, running twice a week, takes 17 hours.

Daniel W. Getschell, engineman of the train which ran into a preceding passenger train at Sharon, Mass., Aug. 21, wrecking a passenger car and killing four passengers, has been tried in the District Court at Dedham, Mass., and convicted of manslaughter. On Tuesday of this week he was sentenced to two years' imprisonment.

The Montana State Board of Equalization, in a report recently presented to the Legislature, recommends that the board be empowered to exercise all the duties usually devolving on a state railroad commission, including the regulation of the business not only of railroad companies, but also of telegraph, telephone, express, cattle and sleeping car companies.

It is reported from Chicago that the Chicago & Northwestern is to dismiss all of its female clerks and stenographers who have worked for the company less than two years. An officer of the road is reported as saying that this change is made so as to insure a larger supply of young men to draw upon when candidates are desired for higher positions in the management of the railroad.

The new Boston terminal passenger station is to be opened for business within a few weeks, but only for the Plymouth and Midland divisions of the New York, New Haven & Hartford. The trains of the Providence Division and those of the Boston & Albany road cannot be run to the new station until the present station of the Plymouth Division shall have been abandoned and torn down, making room for the new tracks necessary. On Thursday of last week the 40,000th pile was driven at the terminal station, being one of those for the foundation of the mail and express building.

The Loud bill, amending the law relating to second-class mail matter, has been reintroduced in Congress. The House Committee on Judiciary has ordered a favorable report on a bill to authorize transportation companies to file indemnity bonds in certain cases. The bill is designed to relieve steamship and transportation companies. For instance, a steamer loaded with freight and passengers may be detained on a legal process issued on behalf of a claimant. This may force a settlement from the company and amount to absolute blackmail. The bill enables transportation companies in such cases to file indemnity bonds.

A Railroad President in Trouble.

William A. Simmons, President of the Carrabelle, Tallahasse & Georgia Railroad and the Gulf Terminal & Navigation Co., was recently convicted in Chicago of swindling and is liable to a fine of $2,000 or imprisonment for one year, or both. The indictment against him was secured in the matter of a transaction with the Hon. T. B. Bryan, of Chicago, in which Simmons, by the use of the names of business men of high repute and by other arts, succeeded in imposing upon Mr. Bryan and getting something for nothing. Simmons has for some time flourished as Vice-President and General Counsel of the Clark Syndicate Companies, of which Mr. William Clark, the head of the famous O. N. T. spool cotton works, is President. Dr. Zeh, of Newark, Robert Cumming and R. B. Symington are among the Directors of the syndicate. It looks as if they, too, had been victims of a very clever and designing man. It is, however, too early to speak finally, as a motion for a new trial has been made and the result of that we have not yet heard.

Chicago Street Railroad Franchises.

The City Council on Dec. 12 recalled the 50-year extension ordinance (known as the Lyman ordinance) for the street railroads from the joint committee to which it was first referred and sent it to the Railroad Committee. By a vote of 38 to 25 a resolution was passed declaring that no ordinances extending street railroad franchises should be entertained until the Allen law is repealed. Public sentiment is strongly against these ordinances, and the result of the test of strength at the Council meeting indicates that the companies stand but slight chance of securing any acceptable ordinances at this time, although it is expected that a substitute ordinance will be introduced. (Dec. 16, p 900.) The reference to the Railroad Committee, noted above, probably buries the whole subject until action shall be taken by the Legislature, as the City Council has now adjourned to Jan. 4.

Louisiana Railroad Commission.

The State Railroad Commission, established by the new constitution of Louisiana, recently adopted, was organized at Baton Rouge, Dec. 9. The members are C. L. De Fuentes, R. N. Sims, Jr., and W. L. Foster. Mr. De Fuentes has been chosen Chairman and the Secretary is C. J. O'Shaughnessy. The Chairman's term is six years; Mr. Sims drew the four-year term and Mr. Foster the two-year term. The Board will hold a business meeting some time next month.

Hungarian Baggage Rates.

The rates for carrying baggage on the Hungarian State Railroads are to be raised. Heretofore they have been: For 34 miles or less, 10 cents for 110 lbs. or less, 20 cents for greater weights up to 220 lbs., and 41 cents for weights greater than 220 lbs. For greater distances up to 62 miles, these rates were doubled; and for all distances over 62 miles they were quadrupled. There is no free baggage. Now under this tariff a piece of baggage weighing 154 lbs., carried from Paris to the capital of Roumania, a distance of 1,607 miles, pays $10.33 charges, and of this the Hungarian State Railroads, which carry it 609 miles, get $1.63. On another route 646 miles long, 100 miles of which is in Austria and all the rest in Hungary, out of $1.08 charged for 110 lbs., 42 cents goes to Hungary.

The new baggage rates vary for seven instead of three distances. For weights of 110 lbs. or less, the charge is 10¼ cents for 50 kilometers (31 miles) or less, and for other greater distances up to:

Kilometers	100	200	300	450	600	More than 600
Charges, cts.	20½	41	61½	82	$1.02½	$1.23

For greater weights up to 220 lbs. these charges are doubled; for weights above 220 lbs. they are quadrupled. At these rates the American's 150 lb. trunk would cost him $1.23 from New York to Albany, $1.64 to Boston or Washington, and $2.46 to Buffalo or any more distant place.

The Railroads of Cuba.

In Mr. R. R. Porter's special report on Cuba he has this to say about railroads:

"The railway system of Cuba, consisting of seven companies, the aggregate length of which is only 1,467 kilometers, or 917 miles, is entirely inadequate in bringing the extreme ends of the island together, Santiago and Havana in point of the time being as far apart as San Francisco and New York, though only separated by a distance of a few hundred miles. In the opinion of your Commissioner, from whatever standpoint it may be viewed, no one enterprise could do so much to improve the situation upon the island. No revolution could have existed in Cuba if such a railroad had been completed by the former government, and nothing will so rapidly tend to the revival of commercial and general business as the facility for quick passage from one end of the island to the other, and from the trunk line over branches to the seaboard cities. The entire country will be open to commerce, lands now of practically no value and unproductive will be worked, the seaport towns will become active, and commerce between the island and the United States will soon be restored to the former figures of approximately $100,000,000 per annum. After a careful study of the situation it would seem extremely doubtful if such an enterprise could be made a commercial success for many years to come without material assistance from those responsible for the industries and future of Cuba."

The Engineer and the Bear.

The Engineers' Club, New York City, has put in the hands of Mr. H. deB. Parsons, Consulting Engineer of the New York Zoological Society, money to buy a bear to be given to that Society. It is proposed to buy a young grizzly, and preferably from California. The question has been raised "Why a bear? Why should not the Engineers' Club give the Zoological Garden a goat or any worthy specimen of natural history?" This shows ignorance and want of appreciation of the place of the engineer in American history. The bear stands for the great dominion stretching from the eastern foothills of the Rocky Mountains to the Pacific Ocean, which the engineer has given to the United States and to mankind. That alone is reason enough for choosing a bear. We have not heard what his name is to be, but we suggest that he be called Uncle John.

Closing of Lake Navigation.

With the expiration of marine insurance on Dec. 12 the lake season closed, with many vessels fast in the ice at different points on the lakes, some of them being seriously damaged. There has been a large volume of traffic, but profits have been small. Some vessels were run at a loss, but the largest and best managed carriers earned about 10 per cent.; the average profit is probably between 4 and 5 per cent. The daily average rate on corn from Chicago to Buffalo, both this year and last, was 1.388 cents a bushel. On wheat from Duluth to Buffalo the average daily rate was 1.839 cents. In view of the good rates on coal shipments up the lakes, and the advantage gained by the improvements in St. Mary's River, Chicago and Duluth are now pretty nearly on an equal footing in lake commerce. The average daily rates on iron ore were: From the head of Lake Superior to Ohio ports, 58.3 cents per ton in 1897, and 57.86 cents in 1898; from Escanaba, in 1897, 44.26 cents, and in 1898, 49.51 cents. On hard coal from Buffalo to Chicago, in 1897, 27.82 cents, and in 1898, 27.61 cents. On soft coal from Ohio ports to the head of Lake Superior, in 1898 the daily average rate was 22.67 cents per ton. Rates reached the lowest point early in the season, when for a long time corn was carried from Chicago to Buffalo at ¾ cent, and even ⅝ cent. In August prices improved, and until the middle of October were good. The rate on corn went to 3½ cents, and on iron ore to $1, but by early November the rush was over. The selling of about 50 vessels to go to the Atlantic will produce marked results in many lines of traffic early next season.

The opening of the Canada-Atlantic line (Railroad Gazette, April 29, p. 318), taking freight from Chicago and Duluth to Georgian Bay and thence east by rail, has somewhat dampened the hopes of vessel owners who would like to see a large traffic through the Welland Canal and St. Lawrence River and direct to the sides of ocean steamers at Montreal. It is needless to remark that the great expansion of the iron and steel trade this year has been in large measure due to the low rate (57 cents per gross ton for the 1,000 miles from Lake Superior to the blast furnaces on Lake Erie) at which ore is carried, and this rate is due to the 7,000-ton ship. In the grain trade the railroads have taken a good deal of freight away from the lake route, but vessel owners are more hopeful of profitable business next year than they have been at the close of any season for three years. With the large vessels now common it is clear that harbors that are to retain their business must have 26 ft. of water.

New York Rapid Transit.

A new journal, published in New York City, contains what is said to be a report of a statement by Mr. Croker, in which he is said to have said that "during Mayor Van Wyck's administration the tunnel will be begun." The ruler of New York thinks that this tunnel should be wide enough for four tracks, that it should cost 50 million dollars at least, and that the city cannot build it. He says that men with money "will come forward." Indeed, he is reported to believe that the tunnel will be begun within the coming year.

LOCOMOTIVE BUILDING.

The Southern Indiana will order three mogul engines.

The Mexican RR. has ordered two 10-wheel engines from the Baldwin Locomotive Works.

The Erie has asked prices on about half of the 50 engines referred to in our issue of Dec. 9.

The Montpelier & Wells River has ordered one locomotive from the Manchester Locomotive Works.

The Baldwin Locomotive Works are building two consolidation locomotives for the Michoacan & Pacific.

The Chicago, Burlington & Quincy has ordered two fast passenger engines from the Baldwin Locomotive Works.

The New York, Chicago & St. Louis has ordered seven consolidation engines from the Baldwin Locomotive Works.

The Imperial Chinese Government railroads have ordered 16 more locomotives from the Baldwin Locomotive Works.

The Kansas City Suburban Belt is having two more switching engines built by the Baldwin Locomotive Works.

The Chicago Great Western has ordered 10 10-wheel two-cylinder compound locomotives from the Baldwin Locomotive Works.

The Mexican National has ordered three more narrow gage engines, compound consolidation, from the Baldwin Locomotive Works.

The Baldwin Locomotive Works have received an order to build two engines for the U. S. Government. We understand they are for use in Cuba.

The Baldwin Locomotive Works have received an order to build two narrow gage compound consolidation engines for the White Pass & Yukon.

The Chicago & Northwestern will order a large number of locomotives, probably 30, part passenger, part switching and part heavy freight. They will be ordered by the President of the road.

The Philadelphia & Reading has ordered 20 more locomotives from the Baldwin Locomotive Works, five of which are switching engines. These are in addition to the 10 referred to Dec. 2.

The Pennsylvania will probably build some locomotives at its Altoona shops, for use on the lines west of Pittsburgh, but the details of design and the number to be built have not yet been definitely decided upon.

The Great Northern is preparing to order a large number, probably 50 or 60, locomotives for freight, passenger and switching service. The details of the specifications have not all been settled, although the order will likely be given at once.

The Canadian Pacific is building, at its Montreal shops, 10 large compound consolidation engines, to weigh in working order about 150,000 lbs. They will have wagon top type boilers, with Belpaire fireboxes; 200 lbs. working steam pressure; 57 in. driving wheels with cast steel centers, and Westinghouse brakes.

Of the 10 engines being built for the Schenectady Locomotive Works for the Boston & Albany, five will be compounds for freight service, with 23 and 34 in. x 28 in. cylinders and 54-in. driving wheels, and will weigh 160,000 lbs.; two 10-wheel compound passenger engines, with 23 and 34 in. x 26 in. cylinders and 69-in. driving wheels, and to weigh 150,000 lbs.; and three "noiseless" compound six-wheel switchers, with 19 and 29 in. x 26 in. cylinders, and to weigh about 112,000 lbs.

The Midland Railway of England has placed orders in the United States for 20 locomotives, 10 with the Baldwin Locomotive Works and 10 with the Schenectady Locomotive Works. They will all have 18 in. x 24 in. cylinders and 62-in. driving wheels and weigh, in working order, about 92,000 lbs. We do

not know the date of delivery to be made by the Schenectady Locomotive Works, but the Baldwin Locomotive Works will undertake to make shipment within 60 days, or about the middle of February.

As mentioned in this column last week, the Chicago, Milwaukee & St. Paul is building five more six-wheel switching locomotives at its West Milwaukee shops. They will have cylinders 18 in. x 24 in.; driving wheels with 44-in. centers, and will weigh 103,000 lbs. The boilers will be of the straight top type and the working stress pressure 180 lbs; fireboxes, 78 in. long and 21 in. wide; tank capacity, for water, 3,800 gals., and coal capacity, 5 tons. Westinghouse air brakes, hammered iron axles, Barr metal brake beams, Congdon brake shoes, Sellers injectors, Jerome metallic piston and valve rod packing, Richardson safety valves, Leach sanding devices, French springs, cast-iron wheel centers and the railroad company's standard circular headlights will be used. The couplers and lubricators to be used were not decided on at this writing.

CAR BUILDING.

It is stated that the Valley Railroad will buy some cars.

The Northern Pacific has asked bids on about 540 heavy flat cars.

It is reported that the Indiana, Illinois & Iowa will order 100 freight cars.

It is reported that the Lehigh Valley will buy some more cars early next year.

The Troy & Albany has ordered 10 combination cars from J. M. Jones' Sons.

The Clarendon & Pittsford will this winter order 10 or 12 cars for hauling marble.

We understand the Baltimore & Ohio will place further orders for freight cars.

It is reported that the Boston & Albany is figuring on buying 500 more freight cars.

The Union Railroad has placed an order for 100 steel cars with the Schoen Pressed Steel Co.

The Baltimore & Ohio Southwestern has ordered 550 steel cars from the Schoen Pressed Steel Co.

It has not been decided when the New York & Ottawa will place the order for freight equipment.

The report that the St. Paul & Duluth is considering buying new freight equipment is officially denied.

The Pittsburgh, Bessemer & Lake Erie has ordered 200 more steel cars from the Schoen Pressed Steel Co.

The Pittsburgh & Western has ordered 100 gondola cars of 60,000 lbs. capacity from the Youngstown Car Co.

The Florence & Cripple Creek has ordered 100 narrow gage box cars from the Michigan-Peninsular Car Co.

Armour & Co. have ordered 500 cars from the Wells & French Co. This is in addition to those referred to Nov. 25.

The Philadelphia & Reading was about to place orders for several hundred cars as we were going to press.

The Norfolk & Western is building a number of freight cars at its shops. We understand the order calls for 1,000.

The report published in our issue of Dec. 9, to the effect that the Swift Refrigerator Line has ordered 30 cars from the Wells & French Co., is correct.

It is reported that the Union Pacific, Denver & Gulf is about to order some cars for passenger service, and that it will order some freight equipment early next year.

We are officially informed that the matter of new freight cars for the Oregon Short Line is still under consideration, no conclusion having been reached as to when they will be ordered.

The Pennsylvania will probably build at its Altoona shops, early next year, 1,000 hopper bottom gondola cars of 80,000 lbs. capacity. The details of the design of these cars are now being worked up.

The Burlington, Cedar Rapids & Northern has placed the order for the 400 box cars, referred to in our issue of Dec. 2, with the Barney & Smith Car Co. They will be 34 ft. long, of 60,000 lbs. capacity, for March and April delivery.

The Delaware & Hudson Canal Co. is about to place an order for several hundred freight cars. The number is stated to be 2,200, and it may be that the order for all or part of this new equipment will have been given by the time this paper is delivered.

The 100 furniture cars which the Atchison, Topeka & Santa Fe is building at its Topeka shops are to be of wood, 50 ft. long and of 80,000 lbs. capacity. They will have cast steel bolsters, Player trucks and brake beams, Congdon brake shoes, Westinghouse air brakes, Trojan couplers, American continuous draft rigging, Chicago roofs, Ft. Madison wheels, group spiral springs and A. T. & S. F. brasses, and will be painted with mineral paint.

The Southern Pacific has placed an order with the Ensign Mfg. Co. for 2,000 freight cars of 100,000 lbs. capacity, the details for which are still under consideration. It is possible that 300 of these cars will be steel gondolas. The company has also ordered eight café cars from the Barney & Smith Car Co. and eight sleeping and three dining cars from Pullman's Palace Car Co. With the orders already noted the total orders recently received given by the Southern Pacific Co. aggregate 3,300 freight cars and 35 cars for passenger service.

The Paterson (N. J.) electric road has ordered 10 open cars from the St. Louis Car Co.

The Palmer & Monson Street Railway, of Palmer, Mass., will need one new car. (See Electric Railroad Construction column.)

The Northeast Electric Railway Co., Kansas City, Mo. (now building), will need 17 26-ft. double truck cars. (See Electric Railroad Construction column.)

The Columbia road, of Washington, D. C., has ordered 10 open cars, 40 ft. long, from the American Car Co. They will be mounted on Brill trucks. (See Electric Railroad Construction column.)

BRIDGE BUILDING

ASHTON, R. I.—The Massillon Bridge Co., of Massillon, O., has received the contract for the bridge over the Blackstone River at Ashton. The bid was $5,375. (Nov. 4, p. 802.)

ASPEN, COLO.—A bridge is to be built across Roaring Creek River near Basalt, and bids are wanted until Jan. 2. George W. Nyce, County Surveyor.

AUSTIN, TEX.—City Engineer McFall reports that the foot bridge at Third and Sabine Sts., over Waller Creek, is in a dangerous condition.

BENTON HARBOR, MICH.—Bids will shortly be wanted for repairing the bridge across the St. Joseph River, the cost of which is estimated at $2,000.

BINGHAMTON, N. Y.—The Common Council has decided to ask for bids for the viaduct to be built on Chenango St., across the railroad tracks. The probable cost of the work will be $50,000.

BOSTON, MASS.—A new bridge is being built across Fort Point Channel, as an extension of Summer street. The bridge is of steel, with a pair of draws on pile foundations. William Jackson, City Engineer.

BREWTON, ALA.—A bridge is to be built across the Conecuh River, and a bill is now before the Legislature authorizing the county to issue $25,000 bonds to cover the cost of building.

BUTLER, PA.—The Grand Jury has recommended three new bridges to be built in Butler County at the county's expense. Enos McDonald, County Surveyor, Butler.

CANTON, O.—It is reported that a viaduct is to be built near Newton St. Thomas J. Bidwell is Township Trustee.

CHATHAM, ONT.—The bridge which the Lake Erie & Detroit River Ry. Co. is to build over the Thames River at Chatham is to be a through girder, two-span bridge. The contract for the substructure has been let, and the plans for the superstructure are completed. The company's engineer is Owen McKay.

CHESTER, PA.—Plans are being made by the Pennsylvania RR. for a bridge at Lloyd street, over the tracks of the Philadelphia, Wilmington & Baltimore. The bridge will do away with a grade crossing.

CHICAGO, ILL.—The Engineering Committee of the Sanitary District Board has decided to discuss the plans for the Campbell Ave. and the Chicago & Western Indiana bridges. Isham Randolph, City Engineer. (Aug. 12, p. 584.)

CINCINNATI, O.—A new drawbridge is to be built to replace the present structure at Micken and Central avenues. New bonds will probably be issued to cover the cost of building.

A bridge is contemplated building over White Water River from Harrison, Hamilton county, O., to Dearborn county, Ind. The Board of Commissioners of these counties met on Dec. 14 in Cincinnati to discuss the plans.

COUNCIL BLUFFS, IA.—The City Council several months ago ordered the railroads to raise and remodel their bridges across Indian Creek, so as to give a 42-ft. clearance, the grade to be decided by City Engineer L. L. Etnyre. Following are the railroads and the bridges they will have to change:

Chicago & Northwestern Ry., at First and Twelfth avenues, three bridges: Chicago, Rock Island & Pacific Ry. between Twelfth and Thirteenth avenues, three bridges; Chicago, Burlington & Quincy Ry., at Eleventh and Thirteenth avenues, two bridges; Union Pacific Ry., at Fifth and Tenth avenues, two bridges; Chicago, Milwaukee & St. Paul, at Thirteenth avenue, one bridge; Omaha & St. Louis Ry., at Fifteenth avenue, one bridge. The C., B. & Q. Ry. has partially completed its work; the O. & St. L. Ry. has driven the piling for abutments and the other roads expect to commence work in the spring.

The Illinois Central, now building into the city, will also build in the spring, and the Omaha Bridge & Terminal Ry. Co. will commence work on its 86 ft. span about the first of the year. The material is now on the ground.

DENVER, COLO.—Plans have been prepared by Engineer H. C. Lowrie, of the Board of Public Wroks for the new viaduct on Fourteenth street. (July 1, p. 483.)

DETROIT, MICH.—C. W. Hubbell, Chief Engineer of the Water Board, is reported as stating that it is proposed to replace several 30-ft. wooden bridges with 40-ft. bridges in the Water Works Park. No definite action has been taken.

ELORA, ONT.—The Wellington County Council has decided to build a new steel bridge to cost about $3,500. Tenders will be asked for in a few days.

EL PASO, TEX.—Work has been begun by the Mexican Central Ry. on a new steel bridge across the Rio Grande at El Paso, to take the place of its present one of wood.

HARRISBURG, PA.—An ordinance has been presented to the Common Council for a subway on Market St. to do away with a grade crossing. (Nov. 25, p. 850.)

HASTINGS, NEB.—In January bids will be asked for building county bridges in the year 1899. D. R. Bigelow, County Clerk.

HERKIMER, N. Y.—The County Board of Supervisors have been petitioned for permission to bond the town of Herkimer to the extent of $13,500 for a bridge over the West Canada Creek. Plans were reported being prepared for this bridge last June. (June 17, p. 442.)

JACKSON, MISS.—Early in January the city will issue $20,000 6 per cent. 20-year bonds for the building of a Melan arch bridge 100 ft. wide, with two spans, each 42½ ft., also some small rolled girder bridges. D. P. Porter, Clerk; W. G. Kirkpatrick, City Engineer. (Dec. 2, p. 866.)

KANLOOPS, B. C.—A bridge is to be built by the Canadian Government over the Thompson River, to cost about $40,000. F. C. Gamble, Engineer Department of Public Works, Victoria.

KANSAS CITY, MO.—The North East Electric Ry. Co. will build a new steel bridge. (See Electric Railroad Construction column.)

LE ROY, N. Y.—The State Railroad Commissioners met in Le Roy Dec. 20, to hear arguments in regard to building a bridge at Haskin's Crossing, over the Buffalo, Rochester & Pittsburgh Ry. The bridge will probably cost $8,000, to be divided as follows: $2,000 to be paid by the state; $4,000 by the railroad company, and the remainder by the town of Le Roy. Carlos A. Hull, County Clerk, Batavia.

LITTLE ROCK, ARK.—Senator Jones, of Arkansas, on Dec. 6, introduced in the United States Senate a bill authorizing the Choctaw & Memphis RR. Co. to build bridges across the Arkansas and other navigable rivers in the state of Arkansas, as may be necessary. The bridges are to be recognized as post routes and are to be open to all railroads and at the option of the railroad company may be used for the passage of teams and vehicles. Plans for bridges must first be presented to the Secretary of War for his approval. The bill was read twice and referred to the Committee on Commerce. This is the branch the Choctaw, Oklahoma & Gulf is building from Wister Junction, Ind. T., 164 miles east to Little Rock, Ark. (Sept. 23, p. 712.)

MAQUOKETA, IA.—It is stated that a 200-ft. iron bridge is shortly to be built in Monmouth Township at a cost of $3,500. Fred Fischer, Auditor.

MEXICO, MEX.—The Monterey & Gulf RR. Co. is building a bridge across the San Juan River.

MOLINE, ILL.—The J. G. Wagner Co., proprietors of the Milwaukee Bridge & Iron Works, has secured the contract for building the bridge across Rock River, and also for removing the present structure. The new bridge is to be in place and ready for traffic by Oct. 1, 1899. Work will be begun on the granting of approval of the War Department.

NELSON, NEB.—Bids are wanted until Jan. 3 for repairing two 84-ft. bridges in Nuckolls county. N. A. Clark, County Clerk.

NEWARK, N. J.—The Pennsylvania RR. Co. has awarded a contract to the Edge Moor Bridge Works for the building of a steel drawbridge to replace the present structure across the Passaic River, on the New York Division. The bridge at that place is 500 ft. long, has three spans and holds two tracks. William H. Brown, Philadelphia, Chief Engineer.

NEW YORK, N. Y.—The Board of Aldermen adopted, on Dec. 20, the resolution providing for the construction of the Blissville bridge across Newtown Creek.

OAKLAND, CAL.—The County Surveyor has been instructed to submit to the board plans and specifications for a bridge to cross Arroyo Mocho Creek on county road at the point recommended. Frank C. Jordan, Clerk to Supervisors, Alameda County, Oakland.

OGDEN, UTAH.—A steel truss bridge 140 ft. long and 18 ft. wide is to be built across Weber River at Ogden. Bids are wanted for the work until Dec. 28. Newton Farr, Engineer, Clerk to the County Commissioners, Weber County.

OROVILLE, CAL.—The south approach of the Oroville bridge is to be rebuilt. H. D. Lausen, Clerk, Butte County.

OTTAWA, ONT.—The Town Council of East Ottawa will build a bridge over the Rideau Canal at Main street.

PHILADELPHIA, PA.—Bids were opened Dec. 13 by Director of Public Works Thompson and Engineer Geo. S. Webster for the superstructure of the Gray's Ferry bridge across the Schuylkill River, which is to be entirely of steel. The bridge will have a draw span and be operated by electricity. There will be two plate girder viaduct approaches. The entire length of the bridge will be approximately 1,900 ft. The appropriation for this bridge was $100,000, and at the time it was made it was understood that additional funds would be furnished for the completion of the approaches and the paving of both bridge and approaches, operating machinery, etc. The masonry work has been completed. The following are the bids received for the work: Phœnix Bridge Co., $145,000; Elmira Bridge Co., $164,750; Pennsylvania Steel Co., $167,422; Carnegie Steel Co., $186,493; New Jersey Steel & Iron Co., $189,000.

Several bills have been introduced in the Common Council for building a bridge over the Philadelphia & Reading R.R. at East and Cresson streets.

PITTSBURGH, PA.—The Consolidated Traction Co., which is about to make several extensions of the line, will build several bridges. (Dec. 12, p. 869.)

PLATTSMOUTH, NEB.—Bids are wanted until Dec. 31 for building several bridges in Cass county during 1899. James Robertson, County Clerk.

PORTAGE-DU-FORT, QUE.—A new bridge will be built in place of the one which recently collapsed.

SACRAMENTO, CAL.—Sealed bids will be received by the Board of Supervisors of Sacramento County at their office in Sacramento, Cal., until 2 p. m., Jan. 5, 1899, for the building of three pile trestles on Grand Island, Sacramento county, about one-half mile west of Ryde, and aggregating a total length of 214½ ft. Bids must be accompanied by a certified check in an amount equivalent to 10 per cent. of the aggregate amount of the bid submitted, or by a cash deposit, or by a bond equivalent thereto. W. B. Hamilton, Clerk of the Board.

SAN RAFAEL, CAL.—A bridge is to be built on Mt. View St., at the railroad crossing. Jas. W. Cochrane offers to pay for part of the work.

SANTA CRUZ, CAL.—Sealed proposals are invited by the Board of Supervisors of Santa Cruz County for the construction of a bridge across Valencia Creek, near Aptos, in accordance with the plans and specifications on file in the office of the board. Each bid must be accompanied with a certified check, payable to Ed. Martin, County Clerk, in 10 per cent. of the amount, as a guarantee of good faith on the part of the successful bidder. Bids will be received until Dec. 23. Ed. Martin, County Clerk.

SPOKANE, WASH.—A bridge will probably be built on Main St. westward from Lincoln St.

SYRACUSE, N. Y.—The new bridge over the canal at Salina St. is reported to have fallen Dec. 13, while it was being tested.

WASHINGTON, D. C.—The Columbia Ry. Co. will build three steel bridges on its new extension (see Electric Railroad Construction column).

A bridge is proposed built across the Potomac River to Arlington, Va. Estimated cost, $1,250,000.

WEST POINT, NEB.—Work on the new bridge across the Elkhorn River, just west of West Point, will shortly be begun.

WILMOT, N. S.—The Government will build a steel bridge over the Black River.

WINDSOR, ONT.—The Sixth street bridge, which was recently destroyed by a St. Paul & Duluth train, will be repaired immediately. The city will probably do the work and charge the cost to the railroad company. L. W. Rundlett is City Engineer.

WINTERTON, N. Y.—The New York, Ontario & Western is putting in a new iron bridge across the stream which is the dividing line between Orange and Sullivan counties, about a mile south of Winterton.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Atchison, Topeka & Santa Fe.—Preferred, 1 per cent., payable Jan. 16.

Chicago, Rock Island & Pacific.—Quarterly, 1¼ per cent., payable Feb. 1.

Fitchburg.—Two per cent., payable Jan. 16.

Minneapolis & St. Louis.—First preferred, semi-annual, 2½ per cent.; second preferred, semi-annual, 2 per cent., payable Jan. 14.

Northern Pacific.—Common, semi-annual, 1 per cent., payable Feb. 3.

Oregon RR. & Navigation Co.—Preferred, 2 per cent., payable Jan. 3.

Southern.—Preferred, 1 per cent., payable Jan. 20.

Steubensville & Indiana (P., C., C. & St. L.).—Five per cent., payable Jan. 1.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

American Society of Civil Engineers.—Meets at the house of the Society, 220 West Fifty-seventh street, New York, on the first and third Wednesdays in each month, at 8 p. m.

Association of Engineers of Virginia.—Holds its formal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building, Roanoke, at 5 p. m.

Boston Society of Civil Engineers.—Meets at 715 Tremont Temple, Boston, on the third Wednesday in each month at 7:30 p. m.

Canadian Society of Civil Engineers.—Meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday at 8 p. m.

Central Railway Club.—Meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

Chicago Electrical Association.—Meets at Room 1737, Monadnock Building, Chicago, on the first and third Fridays of each month at 8 p. m. J. R. Cravath, Secretary.

Civil Engineers' Club of Cleveland.—Meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

Civil Engineers' Society of St. Paul.—Meets on the first Monday of each month except June, July, August and September.

Denver Society of Civil Engineers.—Meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month, except during July and August.

Engineers' Club of Cincinnati.—Meets at the rooms of the Literary Club, 25 East Eighth street, on the third Tuesday of each month, excepting July and August, at 7:30 p. m.

Engineers' Club of Columbus. (O.)—Meets at 12½ North High street on the first and third Saturdays from September to June.

Engineers' Club of Minneapolis.—Meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

Engineers' Club of Philadelphia.—Meets at the house of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month at 8 p. m., except during July and August.

Engineers' Club of St. Louis.—Meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

Engineers' Society of Western New York.—Holds regular meetings on the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

Engineers' Society of Western Pennsylvania.—Meets at 410 Penn avenue, Pittsburg, Pa., on the third Tuesday in each month at 7:30 p. m.

Locomotive Foremen's Club.—Meets every second Tuesday in the club room of the Correspondence School of Locomotive Engineers and Firemen, 335 Dearborn street, Chicago.

Montana Society of Civil Engineers.—Meets at Helena, Mont., on the third Saturday in each month at 7:30 p. m.

New England Railroad Club.—Meets at Pierce Hall, Copley Square, Boston, Mass., on the second Tuesday of each month.

New York Railroad Club.—Meets at 12 West Thirty-first street, New York City, on the third Thursday in each month at 8 p. m., excepting June, July and August.

Northwest Railway Club.—Meets on the first Tuesday after the second Monday in each month at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

Northwestern Track and Bridge Association.—Meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

St. Louis Railway Club.—Holds its regular meeting on the second Friday of each month at 3 p. m.

Southern and Southwestern Railway Club.—Meets at the Kimball House, Atlanta, Ga., on the second Thursday in January, April, August and November.

Technical Society of the Pacific Coast.—Meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

Western Foundrymen's Association.—Meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is Secretary.

Technical Club, Chicago.

A circular has been sent to members announcing a series of "musical smokers" with other entertainment, to be given at the Club House, 228 South Clark street, on the evenings of Dec. 22, Jan. 5 and 19 and Feb. 2. On the evening of each smoker a table d'hote dinner will be served.

Chicago Electrical Association.

At a meeting of the Chicago Electrical Association, Friday evening, Dec. 16, Monadnock Block, Chicago, Mr. A. V. Abbott, Chief Engineer of Chicago Telephone Co., presented a paper entitled "Wireless Telegraphy." Apparatus used by Mr. Abbott in telegraphing short distances without wires was exhibited.

Western Society of Engineers.

The Western Society of Engineers held a meeting Wednesday evening, Dec. 21, in the Society rooms, Monadnock Block, Chicago. Mr. W. H. Finley, Engineer of Bridges of the Chicago & Northwestern, read a paper describing the rebuilding of the Kinzie street drawbridge over the Chicago River, which was illustrated by stereopticon views.

Illinois Manufacturers' Association.

The second annual meeting of this Association was held at the Palmer House, Chicago, Dec. 12, about 100 manufacturers being present at the meeting and banquet, at which President W. B. Conkey presided. After the dinner Mr. Conkey gave a detailed report of the work of the Association since its organization about one year ago. Addresses were also made by Mr. Levy Mayer on "Corporate Interests;" by Mr. J. H. Hiland, General Freight Agent, Chicago, Milwaukee & St. Paul Ry., advocating cooperation between railroads and manufacturers, and by several others. It was decided to petition the War Department for the location of a purchasing station at Chicago for the department. The old officers were re-elected for the ensuing year. Hereafter meetings will be held every two months.

The Franklin Institute.

At the meeting of Wednesday, Dec. 21, the first paper of the evening was "An Engineer's Observations in Cuba," by Capt. Joseph U. Crawford, Engineer of Branch Lines, Pennsylvania Railroad Company. Capt. Crawford, who has just returned from a two months' sojourn in Cuba, accepted the committee's invitation to give a resume of his observations on the conditions at present existing on the island, with especial consideration of the agricultural, industrial and transportation problems, present and prospective.

Mr. Oberlin Smith, President Ferracute Machine Company, Bridgeton, N. J., described a mining plant designed and constructed for the Chinese Government, with illustrations of the same and of the coins (by megascope projections).

The Civil Engineers' Club of Cleveland.

The regular monthly meeting was held in Case Library, Dec. 13, President Osborn in the chair; present 21 members and 4 visitors.

A committee of three was appointed to consider the feasibility of renting quarter for the Club in the new building of the Chamber of Commerce.

Mr. Edwin L. Thurston, Associate Member of the Club, read a paper on "The Nature and History of Patent Rights." He defined the origin and limitation of the rights enjoyed by a holder of letters-patent, showing them to be only such as the statute confers, and nothing by natural right, or common law. The only right secured by a patent to the patentee is the right to exclude or prevent others from exercising their natural right to make out of their own materials the particular invention which the patent covers. Frequently a patentee of an improvement is excluded from the use of his own invention by some prior patent covering the thing improved. Two theories were discussed as to the nature of a patent right, the one regarding it as a monopoly—the other as a contract between the inventor and the government representing the public. The latter view has been generally accepted by the courts and by Congress in this country. As a contract its language should be liberally construed, so as to give the inventor as complete protection as may be. Considered as a monopoly, a patent is such in form only. It is not an illegal or oppressive monopoly. It deprives no one of any right previously enjoyed, because a patented invention must be new. The author described the progress of patent law since the reign of James I., of England, in 1623 to the present time. The first patent statute in America went into effect April 10, 1790, and was entitled, "An Act to promote the progress of useful arts." The first patent granted was dated July 31, 1790, and was issued to Samuel Hopkins for making pot and pearl ashes. This act was replaced by another on Feb. 21, 1793. Other acts were passed in 1819 and 1832. But in 1836 all preceding acts were repealed and the present system was inaugurated. The new act created the Patent Office, with a Commissioner of Patents. It provided for the registration of patents, thus affording security to the patentee's title. It also provided for an examination to be made by the Commissioner as to the novelty of an invention, and for the establishment of a library of scientific books. This library now contains nearly 60,000 volumes. In 1870 the term of a patent was changed from 14 to 17 years. A new law which went into effect Jan. 1, 1898, provides for the length of time an invention may be known to the public before the inventor loses the right to claim a patent. This law also relates to the effect of a foreign patent upon a United States patent. More than 15 bills are now under consideration by the two patent committees of Congress.

PERSONAL

—Mr. Alexander Nimick, of Pittsburgh, died on Tuesday of this week at the age of 79. He was largely interested in making iron and steel, and was president of several companies.

—Mr. Hillary Messimer, who was at one time Superintendent of the East Pennsylvania Division of the Philadelphia & Reading, died at Reading, Pa., Dec. 16. He was 65 years old.

—Mr. Charles Hughes, senior member of the contracting firm of Hughes Bros., Banges & Gaynor, of Syracuse, N. Y., died suddenly in that city Dec. 18. The firm has built much large work, including one of the locks of the Sault Ste. Marie Canal.

—Mr. J. W. Thomas, President and General Manager of the Nashville, Chattanooga & St. Louis, has given up the duties of the position of General Manager. Mr. Thomas, who is 68 years old, has been connected with that road since 1858. He has been General Manager for the past 15 years.

—Dr. Wellington Adams died last Monday, of pneumonia, at his home in St. Louis. He was 50 years old. Dr. Adams was very conspicuous a few years ago as the chief projector and promoter of the electric railroad to run from St. Louis to Chicago. He had also appeared much in the courts in contesting patents on the applications of electric motors to railroad uses.

—Mr. John E. Wootten died on Friday night of last week at Philadelphia. He was born in Philadelphia Sept. 22, 1823, entered railroad service July 1, 1845, and spent all of his active life in the service of the Philadelphia & Reading Railroad, becoming General Manager of that railroad January, 1877, which position he held for about 10 years. Up to 1873 he was occupied almost continuously in the motive power and mechanical department, but in January of that year he became General Superintendent of the road. As an engineer he made a great mark on locomotive practice, having invented and designed many things. The most important of his designs is probably the Wootten firebox, which is in wide use and which is familiar to all of our readers.

—Mr. Harry Frazier, lately Chief Engineer of the Chesapeake & Ohio Railroad, arrived a few days ago at Vancouver on his return from China. It may be remembered that he went there as Mr. W. Barclay Parsons' principal assistant for the surveys from Hankow to Canton for the American-Chinese Development Company, known as the Brice Syndicate. The Associated Press dispatches say that he "mapped out roads from Peking to Canton, Shanghai to Wu Sung and elsewhere." This, of course, is nonsense. In the first place, the concession has nothing to do with the first 700 or 800 miles south from Peking, and in the second place the Shanghai-Wu Sung Railroad has been in operation now for some months, and, finally, Mr. Frazier could never have left the coast, as he was in China but a very short time.

—Mr. Calvin S. Brice died at his home in New York City on the afternoon of Thursday of last week very suddenly of pneumonia. Mr. Brice had just passed 53, having been born Sept. 17, 1845, in Ohio.

Mr. Brice was the son of a Presbyterian minister, and was educated at Miami University, and had some service in the Civil War. He took a course in law at the University of Michigan, and began to practice at Lima, O., making a specialty of railroad law.

Mr. Brice has had a remarkable career as a financier and organizer. He was the chief promoter of the New York, Chicago & St. Louis, familiarly known as the Nickel Plate. In 1876 he became the general attorney and receiver of the Lake Erie & Louisville, and the following year became its Vice-President. From 1877 to 1886 he was General Counsel of the Lake Erie & Western, and from 1887 until his death was its President. He became Vice-President of the Nickel Plate in 1881, holding that position for two years. From 1881 until June 25, 1892, he was Vice-President of the East Tennessee, Virginia & Georgia RR. Among other executive positions which Mr. Brice held was that of First Vice-President of the Richmond & Danville, from 1883 to 1886; in 1891 he became Chairman of the Board of Directors, holding the position for three years; in 1887 he became Vice-President of the Duluth, South Shore & Atlantic, and held that position up to his death. On Sept. 2, 1895, he became President of the Cleveland, Akron & Columbus, and in 1894 he was chosen President of the Cincinnati, Jackson & Mackinaw, holding those positions at the time of his death. He was also a Director in the Chase National Bank, Director in the Elkhorn Valley Coal Land Co., Homer Lee Bank Note Co., Pacific Mail Steamship Co., Welsbach Commercial Co., and the Western Union Beef Co. He was an active Democratic politician, and was elected to the United States Senate in 1890, where he served six years. He was one of the organizers of the American-Chinese Development Company, in the interests of which a party under Mr. William Barclay Parsons lately went to China. He was a man of vigor, originality and enterprise, and his death will be a great loss to many interests.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—Wm. Hamilton has been appointed Traveling Engineer of the Eastern and Middle Divisions, succeeding W. R. Scott, who is now Trainmaster of the Gulf, Colorado & Santa Fe at Cleburne, Tex.

Baltimore & Ohio.—At the annual meeting of the Baltimore & Philadelphia Division, held in Wilmington, Del., Dec. 14, the following Directors were elected: J. B. Washington, Pittsburgh, Pa.; H. G. Morse, Wm. Comby, H. A. Du Pont and J. H. Jackson, Wilmington, Del.; W. H. Addicks and R. L. Ashhurst, Philadelphia, Pa.; J. Willcox Brown and Wm. T. Dixon, Baltimore, Md. The following officers were chosen: W. H. Addicks, President; J. B. Washington, Vice-President; J. C. Ferra, Secretary, and W. H. Ijams, Treasurer.

Boston Terminal.—W. R. Babcock, the late General Passenger Agent of the New England, has been appointed Ticket Agent, with headquarters at the new terminal depot, Boston.

Brainerd & Northern Minnesota.—The report that J. C. Howard, recently General Agent of the Chicago, Burlington & Northern at Minneapolis, has been appointed General Manager of the B. & N. R., is incorrect. O. O. Winter, who was at one time Superintendent of the Union Depot at Minneapolis, has been appointed General Manager, with headquarters at Brainerd, Minn.

Chicago, Burlington & Quincy.—At a meeting of the directors, held in Boston Dec. 16, Geo. H. Gardner was elected a Director to fill the vacancy caused by the death of John L. Gardner. F. W. Hunnewell was chosen Chairman of the Board, succeeding the late Mr. Gardner.

Chicago Great Western.—T. H. Yorke, heretofore foreman of the machine shops at South Park, Minn., has been appointed Division Master Mechanic of the Southwest Division, with headquarters at Des Moines, Ia. Peter C. Stohr, who has been General Freight Agent, has been promoted to the newly created position of General Traffic Manager, with headquarters at St. Paul, Minn. S. O. Brooks, heretofore Assistant General Freight Agent at St. Paul, has been appointed General Freight Agent, succeeding Mr. Stohr. Mr. Brooks' headquarters will remain at St. Paul.

Chicago & Northwestern.—D. W. Aldridge, Traveling Passenger Agent at Cleveland, O., will, on Jan. 1, take charge of freight and passenger business at that city. He will have two soliciting agents to assist him.

Chicago Northwestern.—J. F. Cleveland has been appointed Land Commissioner, succeeding the late Chas. E. Simmons. Mr. Cleveland was heretofore Assistant Land Commissioner.

Chicago, Rock Island & Pacific.—E. E. Hayne has been elected Treasurer, succeeding J. F. Phillips, deceased.

J. B. Marston has resigned as General Baggage Agent; effective Jan. 1. Geo. W. Duback has been appointed General Baggage Agent, with headquarters at Chicago, Ill.

Cincinnati, Hamilton & Dayton.—Effective Jan. 1, the position of Assistant General Passenger Agent, held by W. J. Nichols, will be abolished. Mr. Nichols, it is understood, will be given a traveling position.

Dayton & Union.—Charles Treble has been appointed Foreman of Shops, instead of Superintendent of Locomotive and Car Department. (Dec. 16, p. 903.)

Denver & Rio Grande.—T. J. Guinn has been appointed Chief Train Dispatcher, with headquarters at Salida, Colo. He succeeds Wm. Rech.

Detroit & Lima Northern.—C. W. Barnes has been appointed Traveling Auditor, with headquarters at Detroit, Mich. Mr. Barnes has been heretofore connected with the Wabash.

Duluth & Northern Minnesota.—M. J. O'Brien of Cheboygan, Mich., has been appointed Superintendent, with headquarters at Duluth, Minn.

Great Northern.—At the annual meeting of the Spokane Falls & Northern, held in Spokane, Wash., Dec. 8, the following Directors were elected: Jas. J. Hill, C. Shields, F. W. Bobbett, W. H. Thompson, Thos. G. Thomson, F. H. Mason and F. E. Ward. The officers are: Jas. J. Hill, President; C. Shields, Vice-President; F. W. Bobbett, Secretary and Treasurer.

R. H. Bowron, heretofore Division Superintendent at Willmar, Minn., has been appointed Superintendent of the Cascade Division, with headquarters at Everett, Wash. Frank Shesgreen, heretofore Division Superintendent at Everett, Wash., has been appointed Superintendent of the Willmar Division, with headquarters at Willmar, Minn.

Iowa Central.—The general offices of this company, which have been located at Marshalltown, Ia., will be moved Jan. 1 to Des Moines, Ia.

Lake Shore & Michigan Southern.—W. Snodgrass has been appointed General Foreman of the Cleveland, O., shops, succeeding O. Antz.

Lehigh & New England.—J. R. Whitney, heretofore Chief Clerk in the General Freight and Passenger Department of the Wilmington & Northern, has been appointed General Freight and Passenger Agent of the L. & N. E. His headquarters are at Pen Argyle, Pa.

Michigan Central.—W. J. Martin, Division Superintendent of the Saginaw & Mackinaw Division, with headquarters at Bay City, Mich., has resigned. M. C. Coyle, heretofore Trainmaster of the Middle Division, with office at Jackson, Mich., has been appointed to fill the vacancy. Clark Haire, heretofore Trainmaster at the Canada Southern Junction, Toledo, O., succeeds Mr. Coyle at Jackson, Mich. Mr. Martin's ill health compelled him to resign.

Minneapolis Railway Terminal.—The officers of this recently incorporated company, referred to in the Construction column, are: President, Wm. D. Washburn; Vice-President, Curtis H. Pettit; Secretary and Treasurer, Wm. D. Hale; Solicitor, M. B. Koon. The above officers, with John S. Pillsbury, form the Board of Directors.

Nashville, Chattanooga & St. Louis.—At a meeting of the Directors held in Nashville, Tenn., Dec. 15, J. W. Thomas, President and General Manager, resigned as General Manager. J. W. Thomas, Jr., who was Assistant General Manager, was elected General Manager.

At a recent meeting of the Board of Directors, held in Nashville, Tenn., Dec. 15, a new set of by-laws was adopted providing for a larger number of officers than was heretofore permitted. Another change made was that of the abolition of the office of General Superintendent, held by M. J. C. Wrenne. Mr. Wrenne, who has been with the company for nearly 30 years, was appointed Superintendent of Transportation. The line was also divided into five divisions, over each of which a Division Superintendent will have charge. The First and Second Divisions, known as the Nashville & Chattanooga Division, will be under the supervision of J. H. Peebles, with headquarters at Nashville, Tenn. The Third or Atlantic Division will be under the supervision of J. L. McCollom, with headquarters at Atlanta, Ga. The Fourth, or Paducah & Memphis Division, will be under the charge of W. J. Hills, with headquarters at Paducah, Ky. The Fifth, or Huntsville Division, will be under the supervision of G. D. Hicks, with headquarters at Tullohoma, Tenn. Assistants will be appointed shortly. The duties of the Real Estate Agent have been assigned to Chief Engineer H. McDonald, with headquarters at Nashville, Tenn.

New York, New Haven & Hartford.—At the annual meeting of the Providence & Worcester, held in Providence, R. I., Dec. 14, the following directors were elected: M. B. I. Goddard, Joseph E. Davis, Jonas G. Clark, John W. Danielson, G. N. Whitin, A. G. Bullock and J. N. Brown.

Norfolk & Western.—We are officially informed that D. E. Spangler has not been appointed Car Service Agent, succeeding A. W. Towsley. Mr. Spangler is performing the duties of the position temporarily and the office is still conducted under Mr. Towsley's supervision, who has temporarily taken on the duties of Chief Clerk to the General Manager. (Dec. 16, p. 903.)

Peoria, Decatur & Evansville.—George A. Smith has been appointed Assistant General Freight Agent, with headquarters at Peoria, Ill., succeeding S. J. Cassety. (Dec. 2, p. 867.)

Philadelphia & Reading.—The office of Engineer of the Wilmington & Northern Division, held by F. L. Hills, will be abolished Jan. 1. His headquarters were at Wilmington, Del.

The Auditing Department of the Wilmington & Northern Division has been abolished, and T. B. Townsend has resigned. John Boyer, heretofore Supervisor, with headquarters at Birdsboro, Pa., has resigned.

Portland & Rochester.—Herbert W. Davis, who has been Assistant Superintendent during the illness of the late J. W. Peters, has been appointed Superintendent, with headquarters at Portland, Me.

St. Louis & San Francisco.—Commercial Agents have been appointed as follows: W. C. Preston at Dallas, Tex.; W. C. Connor at Houston, and E. M. Winstead at San Antonio, Tex.

St. Louis, Belleville & Southern (I. C.).—Clarence F. Parker, General Agent of the Illinois Central at St. Louis, Mo., has been elected President of the St. L., B. & S. He still retains his position as General Agent.

St. Louis, Iron Mountain & Southern (M. P.).—James Gray has been appointed Foreman of the locomotive and car shops at Mer Rouge, La.

Tennessee Central.—Edward Hill has been appointed Chief Engineer (see Railroad Construction column, Dec. 16, p. 904).

Toledo, St. Louis & Kansas City.—At the postponed meeting of the stockholders, held in Toledo Dec. 20, four new Directors were chosen, as follows: Grant B. Schley, James S. Stout, J. F. Clinch and J. S. Bache, all of New York. They succeeded J. S. Osgood, R. G. Ingersoll, J. P. Kneeland and A. L. Mills.

Union Pacific, Denver & Gulf.—J. H. Payne has been appointed Assistant Engineer, succeeding H. A. Woods.

Washington & Columbia River (N. P.).—At a meeting of the Directors, W. G. Pearce was elected Vice-President to succeed Daniel Lamont, resigned.

RAILROAD CONSTRUCTION,
New Incorporations, Surveys, Etc.

BALTIMORE & OHIO.—The Magnolia Coal Co. is reported to have closed a contract with the Cleveland Valley & Terminal line of the B. & O. to build a line from Sandyville, O., east to Magnolia, to connect with the mines. This is practically the same line as that proposed by the Sandyville & Waynesburg (Nov. 18, p. 829), recently incorporated in Ohio to build a line connecting those two places.

BRITISH COLUMBIA SOUTHERN.—This company will apply at the next session of Parliament for power to build or acquire a railroad from a point on its line near Fort Steele, B. C., to Golden, on the C. P. R., by route having the same general direction as the valleys of the Columbia and Kootenay Rivers; also for branch lines therefrom, none of which shall exceed 30 miles in length.

CANADIAN ROADS.—Application will be made to the British Columbia Legislature at its next session as follows:

Messrs. Wilson & Senkler, solicitors of Vancouver, B. C., to build and operate a line of railroad from a point near Quesnelle Forks to Hazleton, near the junction of the Wat-saw-Kwa or Buckley and the Skena rivers.

Messrs. Bodwell & Duff, solicitors, Victoria, B. C., to build and operate a road from a point near the outlet of Kamloops Lake via the plateau of the Bonaparte River on the Cariboo road to the mouth of the Quesnelle River, and thence by the Telegraph trail to Hazleton and to Atlin Lake.

Messrs. Bodwell & Duff, to amend the Kitaamat Railway Act of 1898, so that the road shall run from a point at the north end of Kitaamat Inlet north and east via Copper River, Telegraph Trail and Babine Lake to Germansen Creek at its confluence with the Omenica River.

J. P. Walls, solicitor, Victoria, B. C., to build a road from a point on Taku Arm, near the mouth of the Atlintoo River, to run up that river to Atlin Lake.

Robert Cassidy, solicitor, Victoria, B. C., to build a road from a point on the International Boundary on the head waters of Taku Inlet to Atlin City, or some other point on Atlin Lake, with branch lines to the south end of the Taku Arm of Tagish Lake, or to a point to the south end of Bennett Lake.

Robert Cassidy, to build a railroad from Fort Simpson to Glenora or Telegraph Creek, on the Stikeen River.

Messrs. Fell & Gregory, solicitors, of Victoria, B. C., to build a railroad from Wardner or Cranbrook, via the St. Mary's River to a point on Kootenay Lake, with branches to Fort Steele, to Upper Arrow Lake and to Golden, on the Columbia River, via Windermere to Bear.

The British Columbia Yukon Railway, to build a branch line from the main line to the Taku Arm of Tagish Lake, and thence to Atlin City.

Messrs. McPhillips & Williams, solicitors, of Victoria, to incorporate the Vancouver Northern & Yukon, to run from Vancouver north via Seymour Creek, the Pemberton Meadows and Lillovet to Quesnelle, thence northwest to Hazleton and north to the boundary of the province, with branches from Hazleton along the valley of the Black River to the northern boundary of the province; also to Fort St. John; also along the north shore of Burrard Inlet to the west shore of the north arm of that inlet.

Messrs. McPhillips & Williams, to build a line from a point on the Canadian Pacific, near Lytton, thence via the Fraser River to the mouth of the Quesnelle River.

Application is made to the Dominion Legislature to incorporate a new road to run from Spence's bridge, on the main line of the C. P. R., east to Nicola Lake, British Columbia. The promoters are asked to so change their application for a charter as to build from Kamloops on the main line to run south, as the line would then connect at Kamloops with Cariboo-Omineca Charter Company's line from Kamloops north to the Cariboo District and form an important link in the extension of the Kettle River Valley line.

CENTRAL MICHIGAN.—This company is incorporated in Michigan to build a line in connection with the Michigan & Ohio Belt Line, incorporated in Ohio. The route is from Grand Haven, Mich., southeast via Grand Rapids, Battle Creek, Cold Water and Camden, Mich.; thence through Napoleon and Bowling Green, O., to Fremont, 245 miles. It is proposed to establish a car ferry system between Grand Haven, Mich., and Milwaukee, Wis. The authorized capital stock of the above companies is $5,000,000. It is proposed to issue $7,000,000 of 5% first mortgage gold bonds, payable in 1938. About 200 miles of right of way has been put under contract, and 145 miles graded and nearly ready for cross-ties and rails. The company's map has been approved by the Crossing Board of Michigan. J. W. Boyanton, of Grand Rapids, Mich., is President. (Official.)

CENTRAL VERMONT.—The New London Northern line of this company is reported to have let a contract to Patrick H. Fitzgerald, New London, Conn., to build a branch from Montville, Conn., to Palmerton, about 2½ miles.

CHICAGO, BURLINGTON & QUINCY.—The filling in Sheep canyon, near Lincoln, Neb., will be begun shortly. A large culvert will be built. It is expected the work will cost $85,000.

CHICAGO, ROCK ISLAND & PACIFIC.—Surveyors are reported making cross sections for a spur from Chickasha, Ind., Ter., west 20 miles to Anadarko.

COLUMBIA SOUTHERN.—This company has filed supplementary articles of incorporation to build extensions of its line from Biggs to Moro, eight miles, now completed, to run from Moro, Ore., south to Prineville; also from a point near Cross Hollows to Canyon City, Ore.; also from Hay Canyon Junction to Hay Canyon. The company will also build and operate steamers on the Columbia River and its tributaries. D. C. O'Reilly, of Wasco, Ore., is General Manager. (Dec. 2, p. 867.)

DULUTH & IRON RANGE.—J. L. Greatsinger, President, is reported to have stated that the ore docks at Two Harbors, Minn., will be repaired. Dock No. 1 will be torn down and entirely rebuilt, with double the capacity. The Stewart River branch, from Waldo to Two Harbors, will be relocated and rebuilt. It will be five miles long and the grade will be 1½%.

FARMINGTON & IRONDALE.—Surveys are reported in progress for this line, recently incorporated in Missouri to run from Irondale, Washington county, on the St. Louis, Iron Mountain & Southern, east 20 miles to Farmington. It is stated that building is to be begun at once. The main office is at Farmington, and H. J. Cantwell and W. N. Carter are among the incorporators. (Dec. 2, p. 867.)

FITCHBURG.—Rails are reported laid on the extension from Schuylerville, N. Y., northeast across the Hudson River to Thompson's Mills. (Dec. 2, p. 867.)

GILA VALLEY, GLOBE & NORTHERN.—Track is reported laid for the entire distance from Geronimo, Ariz., northeast 58 miles to Globe. (Nov. 25, p. 852.)

KOOTENAY RAILWAY & NAVIGATION.—Contractor Carlson, late of the firm of Murphy & Carlson, has begun work on the four-mile contract on this company's Nelson & Bedlington line from Bonner's Ferry, Idaho, north 52 miles along the valley of Kootenay River to Kootenay Lake, B. C. This work extends from Kuskanook to the crossing of the Crow's Nest Pass line on the C. P. R., and is considered the most difficult and expensive section on the line. He begins with 100 men and will increase the number as the work progresses. (Nov. 25, p. 852.)

LAKE MANITOBA RAILWAY & CANAL.—N. Keith of Winnipeg, Manitoba, reports good progress in track laying along the extension from Sifton north toward the Swan River country. Track is going down at the rate of about 10 miles per week. (Oct. 28, p. 786.)

LAKE TAHOE.—This company has been incorporated in California to build the proposed line from Truckee on the Southern Pacific, to run south 15 miles to Tahoe City. (New Roads, Dec. 9, p. 885.) Among the incorporators are D. L. Bliss of Tahoe City; D. O. Mills, New York, and M. K. Masten, of 3 Crocker Building, San Francisco, Cal., President of the Maricopa & Phoenix and the Salt River Valley.

LOUISVILLE & NASHVILLE.—The company has appropriated $248,000 for reducing grades on the main stem of the First Division, extending from Louisville, Ky., to Bowling Green, 114 miles. A steel bridge has been recently completed over the Cumberland River at Nashville, Tenn.

MANISTEE & NORTHEASTERN.—This company is building an extension from Sherman's Mills, Mich., west 14 miles to Honor. The work is being done by the company. (Official.)

MEMPHIS TERMINAL COMPANY.—This company is incorporated in Tennessee, with a capital stock of $50,000, to build a terminal line at Memphis. The incorporators are: M. H. Smith, H. W. Bruce, C. Quarrier, T. H. Edgar and J. P. Houston, all officials of the Louisville & Nashville.

MICHIGAN CENTRAL.—This company, according to report, will build a branch from Essex, Ont., south about 15 miles to Kingsville, on Lake Erie, to connect with a line of coal steamers from Sandusky, O.

MINNEAPOLIS RAILWAY TERMINAL.—The incorporators of this company met at Minneapolis Dec. 6 and perfected organization. The purpose of the company is to build terminals for the Minneapolis, St. Paul & Sault Ste. Marie. It is stated that the company has secured options on 2,000 ft. of land

lying to the west of Second St. N., between Fifth and Tenth Aves., and it is proposed to begin condemnation proceedings to secure the remaining parcels of land necessary to connect with the Northern Pacific tracks. The parent company now uses the N. P. terminal facilities in that city. The officers are given under Elections and Appointments. (Dec. 9, p. 885.)

NEW ROADS.—Malcolm McDougall, of Orillia, Wash., has applied to the County Commissioners for a franchise for a standard gage road from Tacoma north toward Seattle. Mr. McDougall has opened an office in the Colonial Bldg., Seattle.

NORTHERN PACIFIC.—With reference to the extensions of this company and its relation to other companies, President C. S. Mellen has made the following statement:

The Northern Pacific is not constructing, nor does it intend to construct, lines for the purpose of injuring any other company, nor do I believe that any other company intends to build lines to injure the Northern Pacific. The only construction which the Northern Pacific has in progress is about 75 miles in the Clearwater country in Idaho. (Dec. 9, p. 885.) The Northern Pacific is the only line in that country or within 50 miles of it. A question has arisen between the Northern Pacific and the Oregon Railroad & Navigation as to whether the Oregon Railway & Navigation should not also be allowed to occupy that country without being considered as invading territory of the Northern Pacific. Except the 75 miles in question, no construction has been authorized by the Northern Pacific Board, and none will be undertaken without its authority. I have none to recommend at present. The Northern Pacific is not engaged in any war with any of its neighbors or competitors, and does not expect to be. Its relations with all its neighbors and competitors are friendly. Local territorial questions, like the one between the Northern Pacific and the Oregon Railway & Navigation, are of common occurrence between railways, and when conservative counsels prevail are generally settled by negotiations, as I assume this one will be in due time. Outside the lines covered by the plan of reorganization, the Northern Pacific since its reorganization was completed, over two years ago, has built only 100 miles of railroad (mostly spurs), and has bought only 150 miles, this latter a line which had been acquired for it in 1892 or 1893, but which the old Northern Pacific had been unable to pay for by reason of its insolvency. The Northern Pacific is not disposed either to build or buy railroads, and I can hardly imagine that any conditions will arise which would lead it to do much building. It may, by reason of business necessity, from time to time, as the country develops, have to build a short branch here and there, and sooner or later it will shorten its line between Missoula and Lewiston or Pasco.

NORTHWEST.—Grading is reported begun on this line from Huntington, Ore., north down the valley of the Snake River to Oxbow and Ballard's Landing in the Seven Devils mining district. (Dec. 2, p. 868.) Isaac E. Blake, 11 Broadway, New York, is President.

OMAHA BRIDGE & TERMINAL.—Track laying has reached a point on Fourteenth St. in Omaha, about 900 ft. north of Nicholas St., and it is stated that 300 ft. more must be laid before the point is reached where operations must be stopped, pending the decision as to right of way. The work of double tracking the road will be taken up in the spring. (Dec. 9, p. 886.)

ONTARIO & RAINY RIVER.—Wm. McCarthy has charge of the surveying to be made east and west from Bad Vermillion Lake on this line, projected from Port Arthur, Ont., west to Fort Francis. (Sept. 9, p. 656.)

PACIFIC & YUKON.—This company has given notice of an application to Parliament at its next session to build a line from Pyramid Horbor, B. C., to the Five Finger Rapids.

PAJARO VALLEY.—Surveys are begun, according to report, for an extension of this road from Salinas, Cal., to run parallel to the Southern Pacific through Soledad, 28 miles, to King City. The road now runs from Watsonville south 23.7 miles to Salinas.

PEMBROKE SOUTHERN.—Officials of this company have notified Robert McCullum, Engineer of the Public Works Department, that their road is completed and ready for inspection. It runs from Pembroke, Ont., southwest 21 miles to Golden Lake. (Oct. 7, p. 732.)

SAN FRANCISCO & SAN JOAQUIN VALLEY.—At the meeting of the Directors, Dec. 13, contracts were let to Grant Bros. and to Foley Bros. for nine miles of grading from Point Richmond via San Pablo to Pineola on the extension from Sacramento, Cal., east to Point Richmond. Near Pineola is a tunnel 800 ft. long, the contract for which was given to Grant Bros. From Pineola to the big tunnel, six miles, grading is well advanced. Borings at the west end of the big tunnel are 1,720 ft. long and at the east end 1,140 ft. East of the tunnel to the Alhambra Valley two tunnels are being built, one 300 ft. long and the other 1,200 ft. From the eastern base of the Contra Costa Hills to Antioch, 17 miles, no grading has been done. From Antioch east 12 miles to the Tules, grading is completed. Through the nine miles of Tules an embankment, seven miles, is being thrown up and two miles of bridges and trestles are building. From the Tules to Stockton eight miles of grading is being pushed rapidly. A bridge 240 ft. long must be built across the San Joaquin River at Stockton, and plans for the same are being prepared. (Dec. 2, p. 868).

SAUGATUCK & SOUTH HAVEN.—This company was incorporated in Michigan Dec. 15, with a capital stock of $176,000, to build a line from Saugatuck south 22 miles along the shore of Lake Michigan to South Haven. The incorporators are: A. A. Patterson, Jr., D. H. Patterson, J. W. Johnson, S. H. Kelly, Benton Harbor; H. T. Leslie, Chicago; W. A. Patterson, Saratoga, N. Y.; F. McOmber, Berrien Springs.

SOUTHERN.—Relaying track between Knoxville, Tenn., and Morristown has been begun. It is proposed to relay 35 miles of 65-lb. rail with 80-lb. rail.

SOUTHERN PACIFIC.—The company has bought 10 blocks in Galveston, Tex., along the bay front, to be used for wharf and terminal purposes. The price reported paid was $200,000.

TEXAS & PACIFIC.—An official is reported to have stated that the improvements at Fort Worth, Tex., will consist of a round house, freight station, freight house and about 20 miles of additional yard trackage.

THUNDER BAY, NEPIGON & ST. JOSEPH.—Mr. Z. Malhiot will begin surveys for this road, projected from Port Arthur north.

WILLIAMSVILLE, GREENVILLE & ST. LOUIS.—The Halladay, Klotz Land & Lumber Co., Greenville, Mo., has the contract for 10 miles of the proposed extension of 60 miles east to the Mississippi River. The road now runs from Williamsville, Mo., northeast 25 miles to Greenville. (Official.)

YUMA & GULF OF CALIFORNIA.—The Mexican Congress on Dec. 15 confirmed the concession to Captain Alonzo B. Smith of Los Angeles, Cal., to build a line from San Jorge, Mex., on the Gulf of California, around the head of the Gulf, northwest 61 miles to the International Boundary, whence it is to be extended 15 miles up the Colorado River to Yuma, Ariz. The concession also includes a line of steamships. Surveys were completed some months ago. (Jan. 14, p. 34.)

Electric Railroad Construction.

BALTIMORE, MD.—The Baltimore & Northern Electric Ry. has made application for permission to extend its lines in the Northern Annex, and to connect with the Baltimore City Passenger Ry. The company offers $3,000 for the privilege. (Nov. 18, p. 853.)

BIRMINGHAM, ALA.—It is reported that work will shortly be begun on the Behren's Park car line. The line will be entirely rebuilt and equipped with 40-lb. rails and be operated by electricity. J. B. McClary, Superintendent of Birmingham Ry. & Electric Co.

BLUFF CITY, ILL.—The Bluff City Electric Ry. has paid to the city of Lake Forest $10,000 and $15,000 in stock for a franchise to operate through that city, though the road has not been built.

BOSTON, MASS.—John P. Simmons, as attorney, has filed a petition for the right to extend the Grafton, Upton & Milford St. Ry. and for other changes in the company's charter. His address is 1010 Exchange St., Boston.

The Norfolk Central St. Ry. Co. has made application for authority to act as a common carrier.

BRANTFORD, ONT.—The Brantford St. Ry. will probably extend its Mohawk Park branch to Cainsville. The estimated cost of the work is $10,000. Wm. Barron, General Manager.

BROCKTON, MASS.—The Brockton, Bridgewater & Taunton St. Ry. Co. has asked for a franchise to build a branch line to its power house. General Superintendent, Jas. F. Shore.

CHATHAM, N. Y.—It is said that James Purcell of Valatie, has in consideration the advisability of building an electric railroad from the village of Niverville and Kinderhook to Lake Point.

CHESTER, PA.—The Chester Traction Co. has made application to the City Council to have the Edystone line discontinued. They claim it is now being run with a loss to the company.

CHICAGO, ILL.—The Cicero Town Board has passed the four ordinances for the extension of street railroad franchises for 50 years. (Dec. 6, p. 904.)

CLINTON, MASS.—The Clinton & Hudson St. Ry. Co. has been granted a franchise to build an electric railroad from the Berlin town line through the main street to the Fitchburg depot. Some time ago a franchise was granted to the Clinton, Hudson, Maynard & Concord Ry. Co. to build over this route, but the time for finishing the work having expired on Dec. 1, the Town Board has granted a franchise to the new company. (Aug. 5, p. 571.)

CUMBERLAND, MD.—It is reported that Isaac A. Walker & Son, 1218 Stephen Girard Bldg., Philadelphia, Pa., have secured by purchase the franchises and charters of the Cumberland & Frostburg, the Frostburg & Lonaconing and the Lonaconing & Westernport railroads. Last March certificates of incorporation were granted to John W. Burchinal and Jas. E. Hotten of Moundsville, W. Va., for these roads. The entire length of the proposed roads is about 28 miles. A survey is already begun. T. D. Howell, Chief Engineer, Philadelphia. (March 11, p. 189; Dec. 16, p. 904.)

DAYTON, O.—The capital stock of the Dayton, Springfield & Urbana Electric Ry. has been increased from $10,000 to $750,000. This company was incorporated in November to build an electric railroad through the cities named. Work is already begun on 26 miles of the line between Dayton and Springfield, and it is expected to have this part in operation by June 1, 1899. Fred Colburn, Springfield, is President, and J. G. Webb, Dayton, Secretary.

DETROIT, MICH.—An ordinance drafted jointly by the street railroad companies of Detroit has been submitted to the Common Council, providing for the sale of six tickets for 25 cents, in compensation for extension of street railroad franchises.

DOYLESTOWN, PA.—The Quakertown & Doylestown Trolley Co. has secured right of way from Quakertown to Silverdale. Work will be begun as soon as the right of way has been secured over the entire route. (Dec. 16, p. 905.)

GRAND RAPIDS, MICH.—It is reported that the Board of Aldermen is preparing a resolution that a provision be made in the City Charter for the city to own and operate street railroads and also to have the matter of issuing bonds for the building of an electric railroad submitted to the people.

HAMILTON, O.—The Hamilton & Eaton Electric St. RR. Co. was incorporated Dec. 12, with a capital stock of $10,000.

HAMILTON, ONT.—The Cataract Power Co. has surveyors in the field for a line from Hamilton, Ont., to Guelph and Berlin. The proposed line is to run from a point on James St. in Hamilton to and along Burlington Heights, and will eventually reach to Flamboro.

HARRISBURG, Pa.—The Harrisburg Traction Co. is about to build an extension from Progress to Linglestown and Cahoe's Springs. E. C. Felton, President.

KANSAS CITY, MO.—The work to be done by the North East Electric Ry. Co. consists of the entire reconstruction of four miles of line, for which contracts are to be let about Jan. 1. Specifications for the proposed work are now in the hands of contractors for bids. One steel bridge, 400 ft. long, will be required. The company will need 17 new 26-ft. double truck cars. Jas. Duane Livingstone was elected President to fill the vacancy caused by the resignation of Wm. M. Reid. (Dec. 9, p. 886.)

It is again reported that an electric railroad is to be built between Kansas City and Leavenworth, Kan. Early in the year the Kansas City & Leavenworth Rapid Transit Co. was granted a franchise to build between these two cities, but nothing was ever done. H. S. Pert is reported as being President of the K. C. & L. R. T. Co.

LODI, N. J.—It is reported that surveys have been finished and franchises obtained for the proposed 2½ miles of electric railroad to be built for the Saddle River Traction Co. between Lodi and Passaic. Sanford & Stillman, 26 Exchange place, Jersey City, have the contract. The Passaic Lighting Co. will supply the power. G. D. Bogart, President.

MIDDLEBORO, MASS.—The Taunton & Middleboro St. Ry. Co., recently incorporated, has applied for permission to locate their tracks in the village of Lakeville, Mass. Among those interested in the company are: Abbott P. Smith, John H. Nelson and Isaac Sampson. (Dec. 16, p. 905.)

MILWAUKEE, WIS.—The Milwaukee Electric Ry. & Light Co. has abandoned its plan to secure an extension of its franchise. The city required a reduction of passenger fare in compensation for the proposed extension. (Dec. 2, p. 869.)

MORRISTOWN, N. J.—J. E. Meleck, Engineer of the Rockaway Valley Ry. Co., Morristown, informs us that the project to build an electric railroad between Paterson and Trenton, N. J., has again revived. He says that "Years ago plans were laid out to build a railroad with local capital from the New Jersey Central in White House to Paterson. It was built a few miles at a time, starting at White House, until it reached the city limits of Morristown, when work was stopped. Four miles has been built since from Morristown to the paper mills at Whippany, leaving a gap of two miles between the Whippany River RR. and the R. V. Ry. It now looks as if enough local capital could be interested to finish the road from Morristown to Paterson, and not use the Whippany road. No company is organized."

NEW YORK, N. Y.—It is officially announced that the Third Avenue RR. Co., whose line is about to be changed from cable to the underground conduit electric system, has awarded the contract for the entire work to the Westinghouse Electric & Manufacturing Company. The contract involves the expenditure of from $5,000,000 to $6,000,000, and covers the steam engines, boilers and entire steam plant, and the electric generators, rotary transformers, static transformers, switchboard apparatus, car equipments, and all of the other electrical apparatus required. Edward Lauterbach, counsel for the company, said, in regard to the new work:

The power plant which we contemplate erecting at 216th St. will have a capacity of 64,000 h. p., which will make it the largest in the world, unless the Metropolitan St. Ry. Co. carries out its intention of making its building a 70,000 h. p. plant. We have already begun work on a part of the system. We expect to have the Third Ave. line proper in operation by electricity by next spring, and to have the 42d St. crosstown line running by electricity in the summer. All the other lines will begin to undergo a change of motive power immediately after next summer, so that the entire system will be operated by electricity within about a year and a half from date.

On Dec. 16 Mayor Van Wyck returned to the Municipal Council without his approval several resolutions which fixed Dec. 22 as the date for a hearing on the applications of several railroad companies for franchises. His reason was that there was not sufficient time for the publication of the advertisements of the hearings, as directed in the resolutions. The vetoed resolutions refer to the following petitions for franchises: The Union Ry., the Southern Boulevard RR. Co., the Third Ave. RR. Co., the New York & Harlem RR Co., Eighth Avenue RR. Co. and Metropolitan St. Ry. Co.

Hearings were held on Dec. 22 on the applications of the following named roads: The Fort George & Eleventh Ave. Ry. Co., the Metropolitan St. Ry. Co. and the Central Park, North & East River RR. Co., for a double track surface railroad on the Boulevard and Columbus Ave., between Fifty-ninth and Sixty-fifth Sts., and the King's Bridge Ry. Co. for extensions of its lines in the northern part of the Borough of Manhattan. (Dec. 2, p. 869.)

OTTAWA, ONT.—There is a probability of the Ottawa St. Ry. Co. extending its line to Brittania early in the spring. An extension is contemplated 22 miles to Rockland. (Dec. 2, p. 869.)

PALMER, MASS.—Chas. F. Grosvenor, President of the Palmer & Monson St. Ry., informs us that the character of the proposed improvements are extensions of about 10 miles, which are still in embryo. The company will need one new car. Chas. E. Fish is now Treasurer, having succeeded Rufus Flynt, resigned on account of ill health. (Dec. 16, p. 905.)

PHILADELPHIA, PA.—The Union Traction Co. on Dec. 15 began the operation of its Federal and Wharton streets line.

PITTSBURGH, PA.—The Pittsburgh & Allegheny River RR. Co. was chartered Dec. 15 to build an electric railroad three miles in length from 32d St., Pittsburgh, to Herr's Island. Capital stock, $30,000. J. H. Park, President; C. E. Clapp, George Wright, Jr., John A. Sutton, and G. M. Black, Pittsburgh; D. E. Park, Allegheny, and W. G. Park, New York City, Directors.

PLAINFIELD, N. J.—The franchise petitioned for by the Plainfield Ry. Co. for extensions was brought before the Common Council on Dec. 12. According to the terms of the ordinance the franchise is to run 99 years, and will be subject to two adjustments as to terms, one at the expiration of 50 years, and another 25 years after that. The railroad company is to macadamize the streets its lines occupy, and to pay 5 per cent. of the gross earnings of the new line to the city from the outset, as well as a license fee for each car operated. (Sept. 9, p. 657; Dec. 9, p. 886.)

PORT CHESTER, N. Y.—The Port Chester St. Ry. has been denied a franchise to build on the Boston Post Road for its extension to Mamaroneck from its present terminus in Rye. (Dec. 2, p. 869.)

QUEBEC, QUE.—The Quebec, Montmorency & Charlevoix Ry. Co. will apply at the next session of the Canadian Parliament to change the name of their company to the Quebec Railway, Light & Power Co.; to permit the purchase of the property and franchise of the Quebec District Ry. Co., and for permission to issue new bonds to pay for the road, and to authorize the building of a branch line into the counties of Levis, Dorchester, Beance and Lotbiniere.

RICHMOND, KY.—B. F. Adir and T. J. Hauss of Cincinnati, who were recently reported as endeavoring to secure a franchise for a street railroad in Richmond, have secured the desired franchise. Bids are wanted at once for the building of the line, which is to be in operation within 90 days. (Dec. 9, p. 886.)

RICHMOND, VA.—The Virginia Electric RR. & Development Co. was recently incorporated with a capital stock of $1,000,000. The company proposes to build an electric railroad from Richmond to suburban towns. It is reported that Capt. Andrew Pizzini is interested in the project.

ROCHESTER, N. Y.—The State Railroad Commissioners gave a final hearing on the application of the Rochester & Sodus Point Ry. Co., which was recently incorporated, to build an electric railroad between the points named. The application is opposed by the N. Y. C. & H. R. RR. (Aug. 26, p. 619.)

ROCKFORD, ILL.—It is again reported that the long delayed contract will shortly be let for building the Rock River Electric Ry. The proposed road is to run from Oregon to Rockford and Byron, Ill., in all about 30 miles. J. B. Bertolet, Chief Engineer, Leaf River, Ill. (Jan. 7, p. 17; March 4, p. 171; Oct. 7, p. 733.)

ROME, N. Y.—A special hearing was given by the Common Council on Dec. 9 on the application of the Rome City St. Ry. Co. and the Utica Suburban St. Ry. Co. for franchise to build through the city of Rome. (Oct. 28, p. 787; Dec. 2, p. 869.)

ST. LOUIS, MO.—M. B. Greensfelder, President of the St. Louis County St. RR. Co., has filed a petition to change the motive power of the road to electricity. The road at present is a three-mile horse road.

SIOUX CITY, IA.—Two miles of additional track have been completed by thet Sioux City & Leeds Electric RR., at an expenditure of about $5,000.

STONEYCREEK MILLS, PA.—Davis Bros., engineers, of Reading, Pa., are reported about to begin surveys for an electric railroad to connect Stoneycreek Mills, Berks Co., and Friendenburg, Schuylkill Co.

TOLEDO, O.—The Toledo & Maumee Valley Ry. is about to build a $40,000 power-house at Miami. According to report, additions are contemplated in the spring, one to Waterville, seven miles, and the other to Woodville, 15 miles.

UNDERCLIFF, N. J.—It is reported that the Bergen County Traction Co. is about to build a spur line from the Fort Lee Ferry at Undercliff through Hudson County, via Cliffside, and make connections with the North Hudson County Ry.

WASHINGTON, D. C.—Senator Bacon, of Georgia, and Representative Otey, of Michigan, on Dec. 8 introduced bills in their respective branches of the United States Congress to amend the charter of the City & Suburban Ry. Co. The bill repeals the clause of the charter requiring the company to lay tracks on Fifth street, N. W., Louisiana avenue and Sixth street, N. W., and the company is authorized to lay double tracks from the intersection of G and Sixth streets, N. W., south along Sixth street, to the intersection of Sixth street and Louisiana avenue, there to connect with another line of the company. The City & Suburban Ry. was formerly the Eckington & Soldiers' Home Ry., and is now changing within the city limits to the conduit electric system, the districts outside the city retaining the overhead system. (July 8, p. 504.)

The contracts for the extension of the City & Suburban Ry. to Muirkirk, Prince George Co., Md., have been let, and work is to be begun at once.

A bill authorizing the Maryland Suburban Ry. Co., of Maryland, to extend its line within the District of Columbia, was introduced in the United States Senate on Dec. 8, by Senator Wellington. The bill allows the company to build either a single or double track road and to carry, besides passengers, light freight and garden truck. Also, to build necessary switches, turnouts, buildings, and mechanical devices. The route is provided for in the bill, and the company is authorized to erect and operate for its own use telegraph and telephone wires.

The Columbia Ry. Co. has begun work on the 10 miles of single track along the Benning road to the District line. It will pass through Benning, Burrville, Kennelworth and Lincolnville. The contracts are let for nearly all the work. Three steel bridges are to be built, for which contracts have not yet been let. Bonds for $500,000 have been issued to cover the cost of this work and also for changing the present cable road to underground electric. The change will necessitate new cars, mentioned in the Car Department. N. Wilson, President; Theodore J. King, Secretary, Treasurer and Superintendent. (Dec. 9, p. 887.)

WEST ROXBURY, MASS.—The West Roxbury & Roslindale St. Ry. has made application for authority to act as a common carrier.

WILLIMANTIC, CONN.—Jesse W. Starr, of New York, is reported as endeavoring to organize the Willimantic St. Ry. Co. and purchase the franchise of the incorporators, who are Gen. Eugene S. Boss, J. Griffin Martin, Vice-President John M. Hall, of Willimantic, and Soloman Lucas, of Norwich. Mr. Starr agrees to put the engineers at work within one week after securing control.

WORCESTER, MASS.—The Grafton, Millbury & Western Electric RR. has been completed from Grafton to Worcester, and was formally opened on Dec. 15. The new road is 11 miles long, and connects with the Consolidated Street Ry. in Worcester.

YOUNGSTOWN, O.—D. S. Miller, G. Q. Miller, Edward Gray, J. H. Mussina and W. H. Miller have made application for a franchise to build an electric railroad between Newcastle and Youngstown. The road is to be known as the Youngstown & Newcastle Electric RR. Falls & Underwood, of Youngstown, represent the applicants.

GENERAL RAILROAD NEWS.

Railroad Earnings.

Showing the gross and net earnings for the periods ending at the dates named:

Oct. 31.		1898.	1897.	Inc. or Dec.	
Burlington, Cedar Rapids & Northern.					
1 month	Gross	$497,943	$477,463	I.	$20,480
1 "	Net	170,136	119,446	I.	50,690
4 months	Gross	3,718,810	3,493,408	I.	225,402
4 "	Net	1,181,739	1,010,863	I.	170,876
Chicago & Eastern Illinois.					
1 month	Gross	$414,934	$442,244	D.	$27,310
1 "	Net	201,276	217,714	D.	16,438
4 months	Gross	1,511,571	1,363,539	I.	148,032
4 "	Net	689,350	600,011	I.	89,339
Grand Trunk.					
1 month	Gross	$1,860,297	$1,967,518	D.	$107,221
1 "	Net	703,219	773,434	D.	70,215
4 months	Gross	6,851,496	7,306,586	D.	455,090
4 "	Net	2,508,951	2,717,951	D.	209,000
Lake Erie & Western.					
1 month	Gross	$314,543	$299,185	I.	$15,358
1 "	Net	149,123	138,115	I.	11,008
10 months	Gross	2,880,039	2,848,885	I.	31,154
10 "	Net	1,198,765	1,184,720	I.	14,045
Minneapolis, St. Paul & Sault Ste. Marie.					
1 month	Gross	$510,768	$479,072	I.	$31,696
1 "	Net	253,124	271,579	D.	18,455
10 months	Gross	3,473,739	3,128,802	I.	344,937
10 "	Net	1,543,009	1,310,010	I.	232,999
Missouri, Kansas & Texas.					
1 month	Gross	$1,538,523	$1,403,555	I.	$134,968
1 "	Net	750,219	660,109	I.	90,110
4 months	Gross	4,456,357	4,445,809	I.	10,548
4 "	Net	1,742,944	1,752,730	D.	9,786
Pittsburgh & Western.					
1 month	Gross	$293,915	$297,175	D.	$3,260
1 "	Net	100,280	97,283	I.	2,997
4 months	Gross	1,157,728	1,134,167	I.	23,561
4 "	Net	353,073	328,493	I.	24,580
Rio Grande Western.					
1 month	Gross	$336,892	$345,877	I.	$8,985
1 "	Net	138,218	133,583	I.	4,634
4 months	Gross	1,183,242	1,239,184	D.	55,942
4 "	Net	417,954	489,755	D.	71,801

Nov. 30.		1898.	1897.	Inc. or Dec.	
Cincinnati, New Orleans & Texas Pacific.					
1 month	Gross	$419,672	$335,482	I.	$84,190
1 "	Net	160,294	122,553	I.	37,741
5 months	Gross	2,094,908	1,599,333	I.	495,575
5 "	Net	749,971	535,897	I.	214,074
Illinois Central.					
1 month	Gross	$2,555,152	$2,563,709	D.	$8,557
Nashville, Chattanooga & St. Louis.					
1 month	Gross	$504,362	$468,451	I.	$35,911
1 "	Net	162,504	154,187	I.	8,317
5 months	Gross	2,648,767	2,452,451	I.	196,316
5 "	Net	1,019,429	908,285	I.	111,144

COLORADO & SOUTHWESTERN.—This company has bene incorporated, with a capital stock of $48,000,000, in Colorado, as successor to the Union Pacific, Denver & Gulf and the Denver, Leadville & Gunnison. The incorporators are E. E. Whitted, Alexis D. Parker, John E. Macbeth, Thos. E. Dunnay and B. T. Winchell. (Dec. 2, p. 870.)

DALLASTOWN TERMINAL RAILWAY & UNION DEPOT.—A special meeting called for Dec. 10, to act upon the question of refunding the outstanding bond issue and increasing the amount for improvements, has been postponed until Dec. 27. (Oct. 28, p. 787).

DETROIT & LIMA NORTHERN.—Special Master Belford has filed his report of claims presented against this road which aggregate $1,025,000. (Dec. 16, p. 905.)

GALVESTON, LA PORTE & HOUSTON.—Application has been made by A. J. Tullock in the U. S. Circuit Court at Galveston, Tex., for the sale of the rolling stock of the company to satisfy liens aggregating $73,056. L. J. Smith, who recently bought the road at foreclosure, has been given until April 1, 1899, to pay the balance of the purchase money. (Nov. 4, p. 806).

KINGSTON & PEMBROKE.—T. W. Nash, Secretary of the company, has given notice that he will receive until Jan. 9 applications from stockholders, bondholders and others for the $20,000 shares of preferred stock of the par value of $50 per share, which is to be issued pro rata to the holders of ordinary stock and first preferred bonds or debentures at the rate of 40 cents on the dollar. This stock was authorized at a meeting of the stockholders at Kingston, Ont., Nov. 21. (Oct. 28, p. 788.)

MEXICAN CENTRAL.—A plan is under consideration in London for the formation of a depositary company, similar to that organized for the Mexican National, whose object shall be pooling the general 4% bonds, and the issuing against them bonds of two classes—A and B. The chairman of the M. C. Finance Committee says with reference to the plan:

> The London owners hold probably three-quarters of the 4 per cent. bonds of our company, and a number of the largest holders of the bonds in London have agreed to form a trust or debenture company or some such corporation to take over the Mexican Central 4 per cent. bonds, to hold same in trust and to issue income A and income B bonds of the English company against them.
>
> As I understand it, they expect the income bonds A to bring a price which would be warranted by their position and safety, and many predict at least 90 for these bonds, while the Bs would remain practically in the same position that the present general mortgage 4s are. This would be equivalent to 77½ for the 4 per cent. bonds, figuring the As at 90 and the Bs at 65.

NEW YORK, ONTARIO & WESTERN.—Messrs. Kuhn, Loeb & Co., New York, gives notice that after Dec. 31 the cash allowance on the consolidated first mortgage 5% bonds, called for redemption on June 1 next, will be reduced one-half per cent. (Nov. 25, p. 854).

OGDENSBURGH & LAKE CHAMPLAIN.—Wm. H. Comstock, Special Master, notifies holders of bonds and scrip of this road that he will be at the office of Chas. Parsons, 15 Broad St., New York, Dec. 23, to receive and have credited on the same the amount payable thereon under the decree of the U. S. Circuit Court for the Northern District of New York, in the case of Stuyvesant Fish, complainant against the company. (Dec. 9, p. 887.)

PENNSYLVANIA.—Notice is given to the stockholders that a meeting will be held on March 28, at the office of the company, to pass on the resolution recently adopted by the directors, which enlarges the voting trust powers by granting to the manager of the trust authority to issue and invest the funds of the company in bonds, shares and securities guaranteed or owned by the Pennsylvania RR. and the Pennsylvania Co.

At the annual meeting of the stockholders of the Delaware line of this company, held in Dover, Del., Jan. 12, a vote will be taken on the consolidation with this company of the Queen Anne & Kent, the Cambridge & Seaford and the Delaware & Chesapeake. The four lines together have a mileage of 224.38 miles and are controlled by the Pennsylvania.

PENNSYLVANIA COMPANY.—Sealed proposals will be received at the office of the Pennsylvania Company for Insurance on Lives and Granting Annuities for the sale of as many of the Philadelphia, Wilmington & Baltimore stock trust certificates as $165,288.50 will purchase, at a price not exceeding par.

PITTSBURGH & WESTERN.—J. P. Morgan & Co., New York, give notice that in view of the probable reorganization of the company, the interests of the first mortgage bondholders should be protected by depositing their bonds with them, with full power to dispose of the same under any plan of reorgantzation, or to sell for par and interest at the option of the owners. (Nov. 18, p. 840.)

BALTIMORE & OHIO SOUTHWESTERN.—The reorganization managers of the Baltimore & Ohio, comprising Speyer & Co., New York, Kuhn, Loeb & Co., New York, and Speyer Bros., London, on Dec. 15, issued a plan of reorganization for the B. & O. S. W., the main points of which are given below. It is proposed that the undersigned shall recommend to the Baltimore & Ohio RR. Co. (as reorganized), that it shall acquire the properties of the B. & O. S. W., and shall issue in exchange therefor and to provide new capital for the enlargement, betterment or extension of said properties its new securities as follows:

B. & O. (as reorganized) Southwestern Division first mortgage 3½ per cent. gold bonds.$40,000,000
B. & O. (as reorganized) new preferred stock (trust certificates) 12,500,000
B. & O. (as reorganized) new common stock (trust certificates) 10,000,000

The new securities and cash are to be offered in exchange for the above-named bonds and stock as follows:

EXISTING BONDS AND STOCK TO BE DEPOSITED.	*CASH.	EACH $1,000 RECEIVES New Southwestern Division 3½ Per Cent. Gold Bonds.	New Preferred Stock Trust Certificates.	New Common Stock Trust Certificates.
Ohio & Mississippi Ry. first consolidated mortgage bonds, extended, 4 per cent	$20.	$1,070.	$100.	....
O. & M. first consolidated mortgage sterling bonds, extended 4 per cent	20.	1,040.	100.	....
O. & M. second consolidated mortgage 7 per cent. bonds (currency)	15.50	1,240.	125.	....
O. & M. first mortgage Springfield Division 7 per cent. bonds (currency)	11.67	1,000.	125.	....
O. & M. general mortgage 5 per cent. bonds (currency)	4.17	900.	100.	....
B. & O. Sw. first mortgage 4½ per cent. bonds	22.50	1,069.	100.	....
B. & O. Sw. first consolidated mortgage 4½ per cent. gold bonds	22.50	900.	100.	....
B. & O Sw. first income mortgage 5 per cent. bonds, series A	....	....	300.	$200.
B. & O. Sw. first income mortgage 5 per cent. bonds, series B	....	....	....	225.
B. & O. Sw. preferred stock	....	....	....	175.
B. & O. Sw. Terminal Co., 5 per cent. gold bonds	8.33	1,030.	125.	....
Cincinnati & Baltimore first mortgage 7 per cent. bonds.	35.	1,000.	125.	....
Marietta Ry. first mortgage 4 per cent. bonds	6.67	1,000.	....	....

*Interest at the rate provided in the old bonds from the date of the last matured coupon next preceding Jan. 1, 1899, up to the date when the new bonds begin to bear interest, namely, Jan. 1, 1899, excepting in respect of bonds represented by Certificates of Deposit stamped "Ex Interest due Jan. 1, 1899," as stated below.

Deposited bonds must carry all coupons and claims for interest on registered bonds maturing on or after Jan. 1, 1899 (excepting B. & O. Southwestern Railway first income mortgage 5 per cent. bonds, series A and B, which must carry all matured and unpaid coupons).

The syndicate will purchase for cash at their face value such coupons and claims for interest on registered bonds maturing Jan. 1, 1899, from holders who deposit their bonds under the plan, upon the certificates of deposit for such bonds being stamped "Ex Interest due January 1, 1899," and said coupons or claims for interest on registered bonds being respectively delivered or assigned to the syndicate or upon its order. Upon the completion of the reorganization there will be paid in cash upon all deposited bonds (not including, however, B. & O. Southwestern Railway first income mortgage 5 per cent. bonds, series A and B), interest at the respective rates provided in the old bonds up to Jan. 1, 1899, from the coupon date last preceding, excepting in the case of bonds represented by certificates of deposit stamped as aforesaid, "Ex Interest due January 1, 1899."

A syndicate has been formed to provide the sum of $5,500,000 required for improvements, cutting down grades, equipment, etc., and also the cash required to take up existing car trusts, floating debt, and other outstanding obligations of the company, to purchase new securities not taken by holders of certain of the existing bonds, and also to make advances and perform other obligations essential for the purposes of the plan.

SALINEVILLE.—Wm. Jackson, Trustee, is reported to have sold to the Cleveland & Pittsburgh line of the Pennsylvania Co., which road extends from the C. P. tracks to Salineville, O., 3.07 miles. The equipment is supplied by the Pennsylvania Co., by whom the road has been operated.

SOUTHERN PACIFIC.—The Texas & New Orleans line of this company will make application to the next Legislature of Texas for a law authorizing it to buy and absorb the Sabine & East Texas, the Louisiana Western Extension and Texas Trunk companies. The two first are already controlled by the S. P. The Texas Trunk has been in the hands of a receiver since Dec. 7, 1892. It was sold in August, 1895, to E. H. Pardee of New York, but was refused a charter at that time. It is still in the hands of the receiver. (Aug. 26, p. 620.)

The Houston & Texas Central of the S. P. has given notice of its intention to apply to the next Texas Legislature for a special law authorizing it to own and operate the property of the Central Texas & Northwestern, the Fort Worth & New Orleans, the Lancaster Tap, the Austin & Northwestern and the Granite Mountain & Marble Falls City, all now operated by the S. P. The company will further ask authority to increase the aggregate of its bonds and stock to an amount not exceeding the value of the property purchased, as determined by the Railroad Commission.

TOLEDO, ST. LOUIS & KANSAS CITY.—Argument on the bill for a decree of foreclosure was heard at Cincinnati, O., last week, and it is probable that a decision will be handed down at the February term of court. (Oct. 28, p. 788).

UNION DEPOT COMPANY OF SPOKANE FALLS.—United States District Judge Hanford has confirmed the sale of this property made at Spokane Falls, Wash., Nov. 12, to the receivers of the Union Pacific, at $245,000, the upset price. (Nov. 18, p. 840.)

WHEELING & LAKE ERIE.—Judge Wm. H. Taft in the United States Circuit Court at Cincinnati, O., Dec. 17, issued a decree in the place of the Metropolitan Financial & Industrial Co. ordering the sale of the road within three months. The upset price is fixed at $1,000,000, and the sale is subject to mortgages of $6,000,000. (Dec. 9, p. 888.)

Electric Railroad News.

BALTIMORE, MD.—The following circular has been issued to the stockholders of Baltimore City Passenger Ry., which was recently reported sold:

Messrs. Alexander Brown & Sons, Mr. Henry A. Parr and Mr. George R. Webb have made an offer to purchase the capital stock of the B. C. P. Ry. Co., which the members of the Board of Directors of the railway company believe it to be for the advantage of stockholders to accept. An agreement awaiting the signature of stockholders can be found at the office, 616 Equitable Building, which all are recommended to examine and sign carefully. The price offered is $90 a share. The offer embraces all the stock, both the old full paid stock and the new stock lately subscribed for, upon which as yet only two installments of the subscription price of $50 a share have been paid. To entitle the holders of the latter to transfer the shares and receive the price of $90 a share under the offer, they must first pay to the company the balance of $15 per share required to make such new stock full paid. The signing of the said agreement of sale will not affect the right of any signer to receive the coming January dividend of $1.25 a share upon the one hundred thousand shares of old stock. The offer is open to the acceptance of all shareholders, provided the right and privilege be availed of before Jan. 21, 1899. The offer is made conditional upon a satisfactory confirmation by experts, appointed by the proposed purchasers, of the written statements which have been submitted to them as to financial and other particulars relaing to the railroad. The purchasers are to pay for the stock and receive transfers after Jan. 20, 1899, and within 90 days from Dec. 8, 1898, the date of the agreement.

The positions of the B. C. P. A. and the B. C. Co. were reputed as being at present about as follows:

Baltimore City Passenger Ry. Co.	
Capitalized, taking bonded debt and 140,000 shares at the price paid by purchasers—90	$16,400,000
Ninety miles of road, per mile	182,000
Last year the company earned	325,000
Or 9 per cent. on present capital of	3,500,000
Baltimore Consolidated Ry. Co.	
Capitalized, taking bonded debt and 384,000 shares of stock at 32½	$23,000,000
Two hundred and fifteen miles, per mile	100,000

A dispatch reports that on Dec. 17 a consolidation of the Baltimore Consolidated Ry. Co., the Baltimore City Passenger Ry. Co., the Baltimore & Northern Ry. Co. and the Baltimore Middle River & Sparrow's Point Ry. Co. was brought about by Alexander Brown & Sons. Over $28,000,000 is involved in the sale, which merges all the street railroads of Baltimore into one system. The new consolidated company is to be organized at once to assume control about Jan. 1, 1899.

CHICAGO, ILL.—The attorney of the village of Harlem has been ordered to begin proceedings for the forfeiture of the franchise of the Suburban RR. Co. (Chicago) in the village limits. The Chicago, Harlem & Batavia Ry., which was leased for 50 years to the Suburban, secured a franchise in Harlem a few years ago on condition that a 5 cent fare to Chicago would be granted after Oct. 12, this year, which has not been done. The fare will either have to be reduced or the franchise forfeited, according to the Harlem Village Board.

CONCORD (S. I.), N. Y.—At the annual meeting, Dec. 12, of the Staten Island Midland RR. Co., the number of directors was reduced from nine to seven. The following constitutes the present Board of Directors: Robert Wetherill, Richard Wetherill, A. G. Paine, M. M. Armstrong, H. T. Walter, M. J. Wightman and W. B. Rockwell. Richard Wetherill, heretofore Treasurer, was elected President and General Manager, to succeed W. B. Rockwell, resigned. Warren Hampsch, formerly of Philadelphia, has been appointed Superintendent, succeeding Frank La Bar.

DENVER, COLO.—The Denver City RR. was sold Dec. 16 at auction by the United States Court, under foreclosure of a $4,000,000 consolidated mortgage of 1893, on which interest remained unpaid. H. E. Rogers, as agent for Frederick P. Olcott, of New York, Chairman of the Reorganization Committee, secured the property for $500,000, the minimum bid allowed. The West End St. RR., which is owned by the Denver City RR., was also sold on the same day, being purchased by the same parties for $40,000. The total mileage of the road is 46, 24 miles being single track and the rest double. Thirty miles are operated by cable, 11 by electricity and 5 by horse. The operating company has a franchise which permits them to change the entire system to electricity. Holders of first mortgage bonds and overdue coupons of the D. C. RR. Co. and the W. E. St. RR. Co. are asked to deposit them with the Reorganization Committee, pursuant to reorganization.

The plan of reorganization provides for the consolidation of the Denver City RR., the West End St. RR., and the Denver Consolidated Tramway Co., the new company to be known as the Denver City Tramway Co. The securities to be assumed by the new company are as follows:

NEW SECURITIES.

New stock	$5,000,000
Of which as part consideration for $3,821,000 Denver City RR. bonds, viz., 13 per cent.	496,730
As part consideration for $300,000 West End bonds, viz., 25 per cent.	75,000
In exchange for $3,000,000 Denver Consolidated Tramway stock and for other purposes	4,428,270
New purchase money mortgage 20-year 5 per cent. gold bonds, secured by a mortgage to the Central Trust Company of New York, trustee, and constituting a first lien on the property, rights and franchises of the Denver City RR. Co. and the West End Street RR. Co., and a lien on the property, rights and franchises of the Tramway Company junior to its existing mortgages; interest to begin to run three months from the date when the new company shall obtain possession of the properties of the three existing companies	2,000,000
Of which as part consideration for $3,821,000 Denver City RR. bonds, viz., 37 per cent.	1,413,770
As part consideration for $300,000 bonds West End Street RR., viz., 25 per cent.	75,000
To be retained in the treasury of the new company, "the proceeds to be used for the building, erecting and equipping of a new power house of sufficient capacity to operate all the lines of the existing three companies, and for the purpose of properly equipping with electricity the railroad now of the Denver RR. Co., and generally improving the respective properties and paying the taxes and the expenses of the foreclosures, purchase and consolidation."	511,230

BONDS TO BE ASSUMED.

Denver Tramway 1st M. 6s. of 1898, due 1908	$498,000
Consolidated M. 6s. of 1890, due 1910	1,219,000
Metropolitan Street RR. 1st M. 6s. of 1891, due 1911	953,000
Denver Consolidated Tramway Consolidated M. 5s. of 1893, due 1933	1,022,000

Assenting security holders will be entitled to the following:

For each $1,000 Bond of	New Bonds.	New Stock.
Denver City RR.	$370	$130
West End Street RR.	250	250

The following constitute the committee on reorganization: F. P. Olcott, Chairman; William L. Bull, Charles H. Merriman, David S. Baker, Arthur K. Hunt; Adrian H. Joline, Counsel; J. N. Wallace, Secretary, 54 Wall street, New York. Copies of the plan of reorganization may be obtained at the office of the Central Trust Co., of New York, 54 Wall St. (Dec. 9, p. 888.)

GREEN BAY, WIS.—A company has been formed for the reorganization of the Fox River Electric Ry., composed of persons holding about 85% of the mortgage bonds of the company. The road has been ordered sold by the courts, and it is expected holders of this stock will buy it in. (Dec. 16, p. 906.)

INDIANAPOLIS, IND.—On Dec. 16 the Supreme Court of Indiana decided that the charter of the Citizens' St. RR. Co. of Indianapolis, will expire in January, 1901, and that the City Ry. Co., which was chartered four years ago, but which was stopped from using any of the streets by the C. S. RR., is entitled to occupy all unoccupied streets imediately and to enter upon all others as soon as the charter of the Citizens' Company expires in 1901.

NEW YORK, N. Y.—Justice Cohen, of the Supreme Court, granted on Dec. 19 an order discharging Arthur Ingraham as Receiver of the Electric Ry. Co., of 1 Broadway. He was appointed Receiver in January, 1897. The assets realized $3,944, and the debts proved amount to $29,141.

OSWEGO, N. Y.—Norman S. Bentley, one of the attorneys in the Oswego St. Ry. foreclosure suit, reports that the foreclosure contract by the Knickerbocker Trust Co., of New York, has been agreed upon in its main features by the attorneys for the defendants. The sale of the road is reported to take place in about two weeks. (Dec. 9, p. 888.)

PHILADELPHIA, PA.—At the annual meeting of the Fairmount Park Transportation Co., President Chas. A. Porter in his annual report called attention to the change in management (Oct. 21, p. 770), showing a saving, which he itemized as follows: Proposed retrenchments, saving per annum—at Woodside Park, $50,000; President's salary, $4,000; General Manager's salary, $5,000; office salaries, $2,000; office rent, $800; salaries at the Park, $7,000—a total of $68,800. The following constitute the Board of Directors as elected at the meeting: Charles A. Porter, Robert H. Foerderer, Dr. J. H. W. Chestnut, Frederick S. Dickson, Dr. L. S. Filbert, Bernard Corr, all of Philadelphia, and John B. Peddle, of New Jersey. The Treasurer's report for the year ending Oct. 31 shows that the road has been operated at a profit.

RED BANK, N. J.—Application was made on behalf of Eatontown township and Long Branch, before Chancellor McGill in Jersey City, Dec. 14, to have the franchise of the Atlantic Highland, Red Bank & Long Branch RR. declared void. The petitioners declare that the railroad company has not fulfilled its promises according to the conditions of the franchise. The railroad company was to pay half of the cost of repairing the highway during the first 15 months after the opening of the electric railroad. In case the company has to pay this money, Counsel Jas. E. Degnan, for the company, asks permission to issue receivers' certificates to pay the charge.

WASHINGTON, D. C.—Senator Pettigrew, on Dec. 8, introduced in the United States Senate a bill to amend the charter of the Capital Traction Co. The bill provides for the repeal of so much of the act entitled "An Act Relative to Rock Creek Ry. Co. of the District of Columbia," approved March 1, 1895, authorizing the company, by a vote of the owners of a majority of its capital stock, to contract with any street railway company owning or operating a connecting or intersecting line, for the joint management, lease, or purchase of such connecting or intersecting line or lines, and to operate the same in connection with its original line, and in case of such contract to provide the means necessary by an increase of its capital stock, not to exceed the actual consideration paid or the actual cost of the necessary equipment. The Rock Creek Ry. Co. was consolidated with the Washington & Georgetown RR., forming the C. T. Co.

A call has been made by the Directors of the City & Suburban St. RR. Co., formerly the Eckington & Soldiers' Home Ry., upon the holders of unpaid up stock of the Eckington road for the immediate payment of money due. (Aug. 26, p. 620.)

On petition of Frederick C. Stevens, O. F. Crosby and Chas. A. Leib, Justice Cox ordered the sale of the Anacostia & Potomac River RR. postponed until Jan. 16. (Dec. 9, p. 880).

WINDSOR, ONT.—The Sandwich, Windsor & Amherstburg Ry. has given a mortgage of $150,000 to Messrs. G. Gooderham and T. G. Blackstock, of Toronto, Ont. This is the first mortgage on the property. The capital stock of the company is $500,000, of which $315,000 have been issued. The company operates 13 miles of electric railroad. J. Coventry is President.

TRAFFIC.

Traffic Notes.

The Oregon Railroad & Navigation Company, now running one passenger train daily each way between Umatilla and Huntington, 217 miles, announces that hereafter two will be run. The company already runs two between Portland and Umatilla.

The Nashville, Chattanooga & St. Louis advertises a tourist sleeping car to run each night between Nashville, Tenn., and Hickman, Ky., the charge for berths to be $1 each. It is said that the cars are "not real tourist cars," such as are used in the West, but old sleepers of the ordinary style. There is no standard sleeping car line on this route.

The retail merchants at various points on the line of the Chicago & Alton between Chicago and St. Louis have for a long time kept up a persistent protest against the action of that road in running very cheap excursions to Chicago and St. Louis, especially on Saturdays and Sundays; and it appears that at last they have succeeded in impressing their view upon the officers of the company, at least to some extent, as they caused the company to abandon one excursion on Dec. 17.

It is announced at Philadelphia that the Pennsylvania Railroad will sell tickets between New York and Chicago, at the regular rate, which will be good by way of Washington, and on which the passenger may stop over 10 days at the Capital. It is said that the eastbound tickets will also be good to stop in Philadelphia for the same length of time. Similar tickets will be sold between Philadelphia and Chicago; and the Washington privilege is also to be granted on St. Louis tickets. For tickets to Pittsburgh by way of Washington the price will be $2 more than by the direct line, but the stopover privilege will be granted.

Chicago Traffic Matters.

Chicago, Dec. 21, 1898.

The new grain tariff of the eastern lines is announced to go into effect Jan. 2. It makes the same rates from East St. Louis and Peoria as are made on export corn from Chicago. On corn for export from points west of the Mississippi River on direct through billing to the seaboard the rates are as follows:

Fifteen cents per 100 lbs., to New York, Boston and Portland; 13c. to Philadelphia and Montreal; 12c. to Baltimore, Norfolk and Newport News. These rates apply from East St. Louis, Alton, Peoria, Bloomington, Beardstown, Chicago and Chicago junctions.

On all other grain the tariff quotes the following rates from the same points: 17½c. to New York, Boston and Portland; 15½c. to Philadelphia and Montreal; 14½c. to Baltimore, Norfolk and Newport News. From other Mississippi River points north of Alton to East Dubuque, inclusive, the net proportional minimum inland rate on corn shall be 17½c. per 100 lbs.; on all other grain and grain products on the basis of 20c. to New York from Chicago. A note on the tariff says: "The above export rates are not to be published."

Chicago officers of the western roads are up in arms over this tariff, which, they say, abolishes a differential in freight rates between this city and St. Louis of 20 years' standing. The export corn rate from Chicago to Atlantic ports has been 5c. under East St. Louis, and the rate from common western points to St. Louis has been correspindingly under the tariff to Chicago. It is believed that the eastern roads will conclude to cancel their notices. The western lines say they will never submit to such an unjust change in the old and rightly established basing rates.

The trouble between the Chicago Great Western and its competitors has been patched up, and all traffic relations resumed. The Atchison's notice of severance of all interchange relations went into effect on the 15th inst. and was revoked on the 16th. The Rock Island's "boycott" would not have gone into effect until yesterday. The Chicago Great Western agreed to cancel its objectionable special tariff, which was issued Dec. 1, and which, it was said, no railroad officer in this city could make head or tail of.

Another move has been made in the contest over passenger differentials between Chicago and the eastern seaboard cities. The Pennsylvania has given notice that, commencing with Dec. 25, it will reduce its Chicago-New York rate via Washington, D. C., from $24 to $20, with the privilege of a 10-day stopover in the latter city. This rate applies over the Fort Wayne route, $18 being the corresponding figure by the Pan Handle. The new rate will be $2 under the present rate of the Baltimore & Ohio via Washington, but there can be little doubt what the latter road will do.

Freight business to the East continues at high-water mark, the Lake lines having stopped receiving freight. Some of the eastbound roads are being taxed to their limit to furnish cars, and one or two have quit soliciting for this reason. Notwithstanding the great movement, rates are still down to bed-rock.